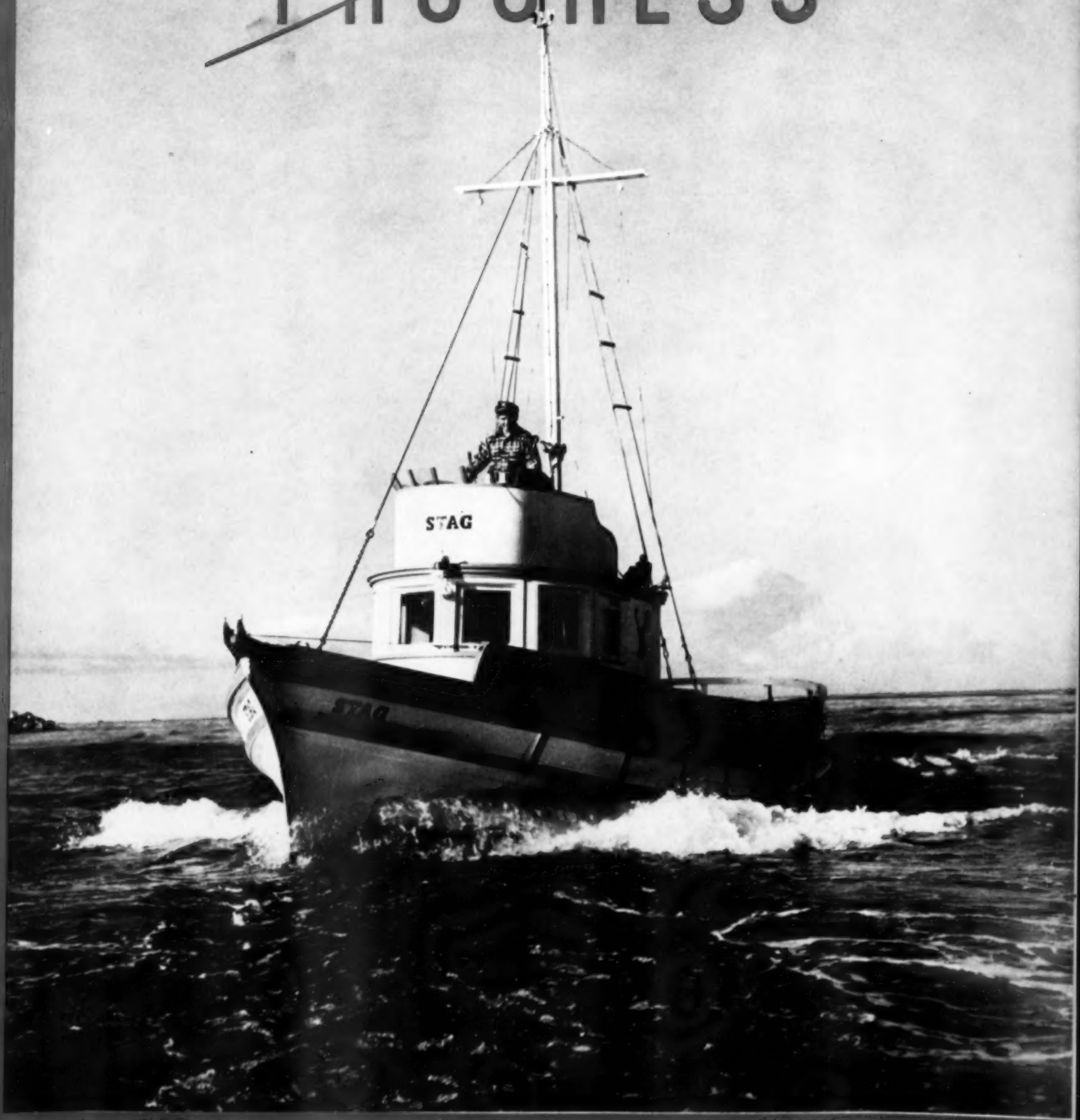
DIESEL PROGRESS

IN INDUSTRY • IN TRANSPORTATION • ON THE SEA • IN THE AIR



FIVE DOLLARS PER YEAR

JULY, 1955

FIFTY CENTS PER COPY

OPERATORS who have consistently used *Texaco Ursa Oils* for twenty or more years report they have found no stuck rings in all that time. That's the sure sign of clean operation, with low maintenance costs and minimum fuel consumption.

The famous *Texaco Ursa Oil* series is a complete line of lubricating oils especially refined and processed to make diesel, gas and dual-fuel engines deliver *more power* with *less fuel* over *longer periods* between overhauls.

And because *Texaco Ursa Oils* deliver these benefits so consistently, year in and year out, it is a fact that —

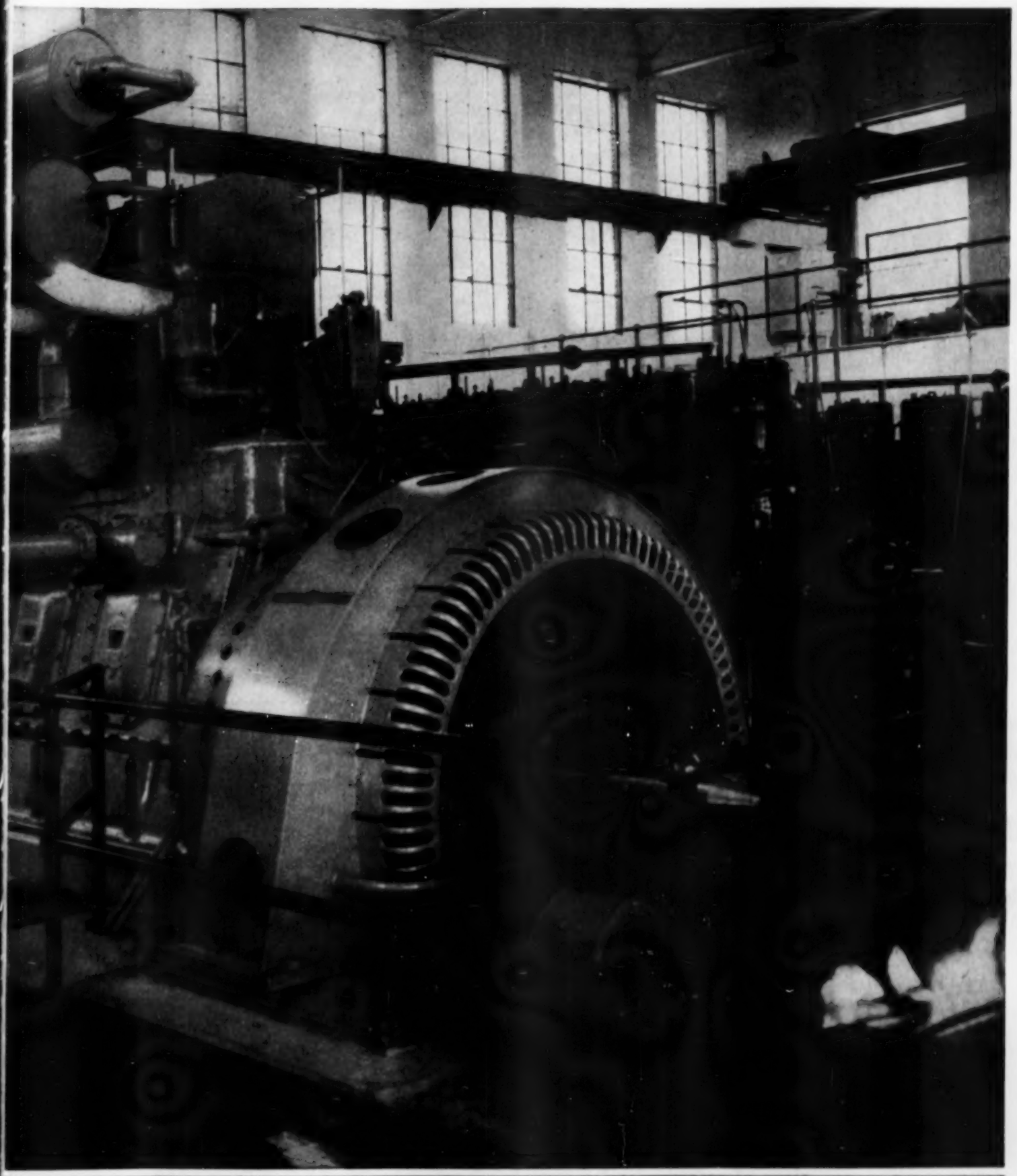
For over 20 years, more stationary diesel h.p. in the U. S. has been lubricated with Texaco than with any other brand.

A Texaco Lubrication Engineer will gladly help you reduce your power generating costs. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

TUNE IN . . .
TEXACO STAR THEATER
starring
DONALD O'CONNOR
or JIMMY DURANTE
on television . . .
Saturday nights, NBC.

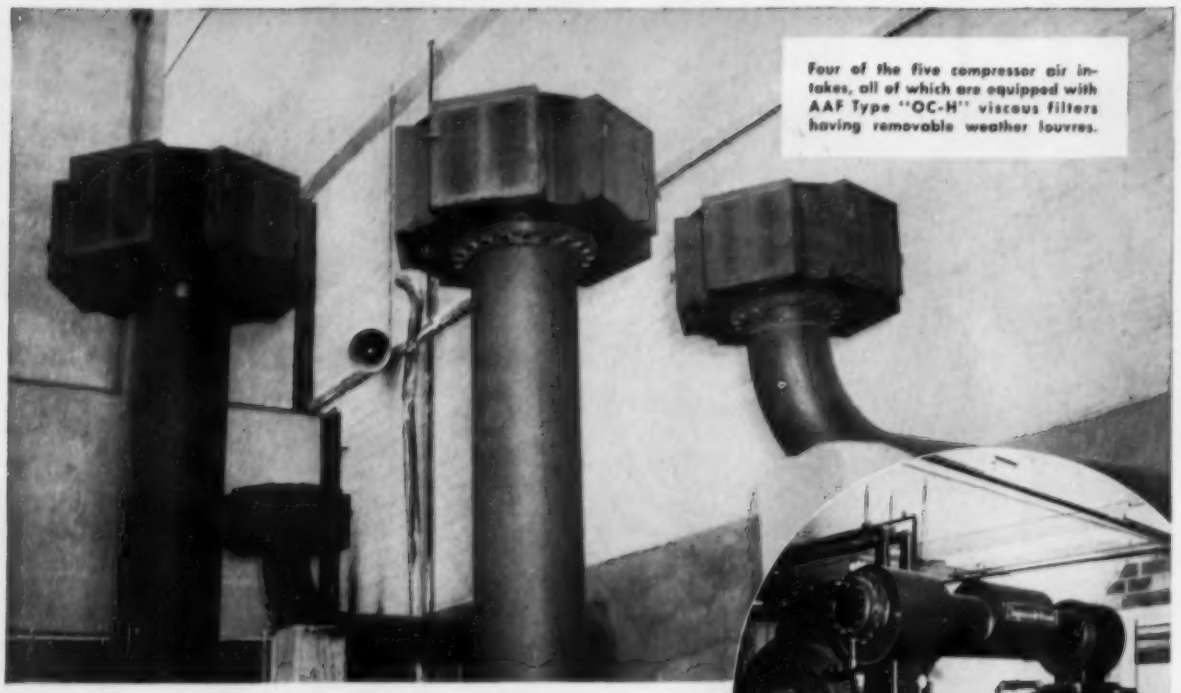
TEXACO

TEXACO

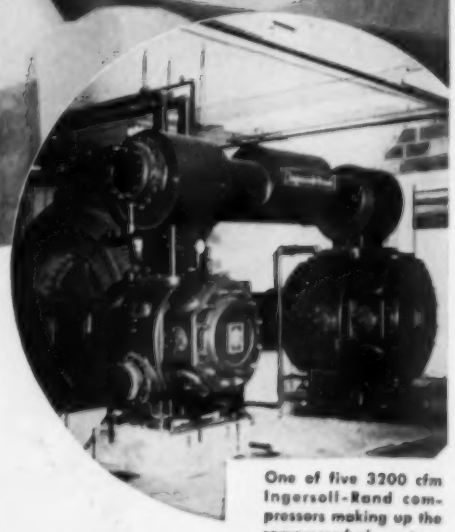


URSA OILS

FOR ALL DIESEL, GAS
AND DUAL-FUEL ENGINES



Four of the five compressor air intakes, all of which are equipped with AAF Type "OC-H" viscous filters having removable weather louvres.



One of five 3200 cfm Ingersoll-Rand compressors making up the compressed-air system.

FILTERS PROTECT

TANK PLANT against air raids from dust

AAF "OC-H" Filters Stand Guard Over Compressed-Air System Serving More Than 2000 Tools

Compressed air is a mighty important commodity at Cadillac's Cleveland Tank Plant. Five 3200 cfm Ingersoll-Rand compressors provide the motive power for over 2000 air-tools and hoists used in producing the famous Walker Bulldog light tanks.

What havoc dust and dirt could play, here, if allowed free access to this vital system! But they're "stopped cold" at the air intake of each compressor by an AAF Type "OC-H" Filter. Selection of this viscous impingement type filter was based on several factors—ease of installation and maintenance, high cleaning efficiency with low resistance to air flow, large dust holding capacity and rugged construction.

Every engine and compressor user should make "clean air" a defense project—and AAF Filters his first line of defense against dust. There's a unit of a type and size designed to deliver clean air to your exact needs and specifications. Write today for complete catalog information.

AAF
herman nelson

American Air Filter
COMPANY, INC.

American Air Filter of Canada, Ltd., Montreal, P. Q. • 408 Central Avenue, Louisville 8, Kentucky

DIESEL and GAS ENGINE PROGRESS

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FRONT COVER ILLUSTRATION

Chris Arcoleo, Monterey, Calif., owns the *Stag*, a party fishing boat powered by a Model D4600 Caterpillar diesel. The vessel has a capacity of 50 fishermen. She is 41 ft. long, is 12 ft. of beam, and has a draft of 5 ft. 9 in.

ELECTRIC POWER

DELCO-REMY HEAVY-DUTY A. C. GENERATORS

Delco-Remy A.C. generators with companion regulators and rectifiers are the hearts of 12-volt A.C.-D.C. electrical systems designed specifically for modern diesel buses with fluorescent lighting and extra-heavy electrical loads.

Desirable performance characteristics include cut-in at low generator rpm . . . maximum outputs (ranging up to 180 amperes) at low to medium speeds. The new generators supply not only alternating current for fluorescent lights but also ample direct current for the heaviest electrical loads coupled with lengthy engine-at-idle periods.

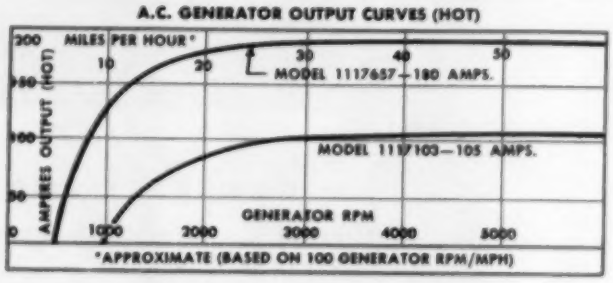
Impressive features of the new generators are their light weight, very high output capacity, and ability to operate over a wide speed range with greatest efficiency. Specify Delco-Remy electrical equipment on your new buses.

A.C. GENERATOR PERFORMANCE DATA (HOT)

Model	Volts	Cut-in RPM	Curb Idle Amperes*	Maximum Amperes	Power Watts SAE	Recommended For
1117103	12	960	5	105	1575	All speeds.
1117657	12	550	130	180	2700	All speeds.
1117062-3-4	6	750	38	90	720	All speeds.

*APPROXIMATE (BASED ON 1000 GENERATOR RPM)

A.C. GENERATOR OUTPUT CURVES (HOT)



*APPROXIMATE (BASED ON 100 GENERATOR RPM/MPH)

DELCO-REMY HEAVY-DUTY D. C. SPLIT-FIELD GENERATOR (120-Ampere Output Capacity)

The Delco-Remy 12-volt split-field generator and its companion regulator are rugged and dependable—designed to meet the needs of diesel transit buses having increased electrical loads coupled with a high percentage of engine idling time.

Desirable performance characteristics include low cut-in, maximum output at less than 1,000 generator rpm. Note performance table at right.

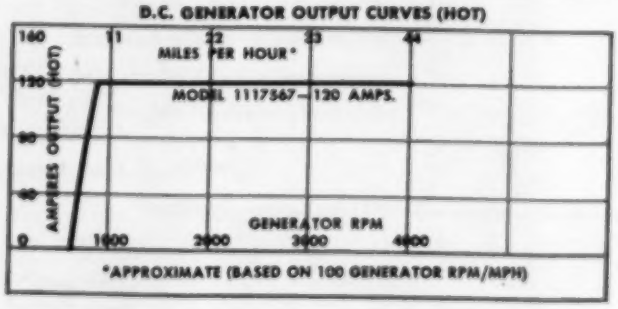
Operating benefits include reduced battery cycling, long battery life, and a simplified electrical system with sustained voltage—at no sacrifice in ruggedness or dependability.

D.C. GENERATOR PERFORMANCE DATA (HOT)

Model	Volts	Cut-in RPM	Curb Idle Amperes*	Maximum Amperes	Power Watts SAE	Recommended For
1117567	12	560	120	120	1800	Low speed & idling.

*APPROXIMATE (BASED ON 1000 GENERATOR RPM)

D.C. GENERATOR OUTPUT CURVES (HOT)

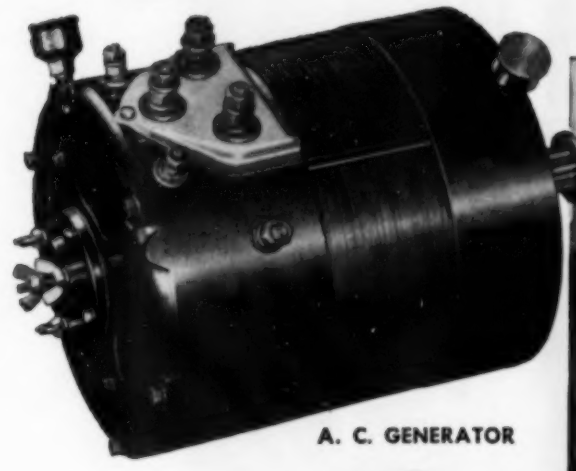


*APPROXIMATE (BASED ON 100 GENERATOR RPM/MPH)

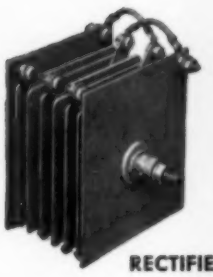
Delco-Remy
ELECTRICAL SYSTEMS

DELCO-REMY • DIVISION OF GENERAL MOTORS • ANDERSON, INDIANA

right for the job



A. C. GENERATOR



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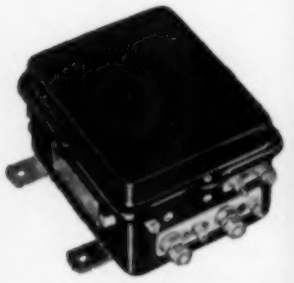
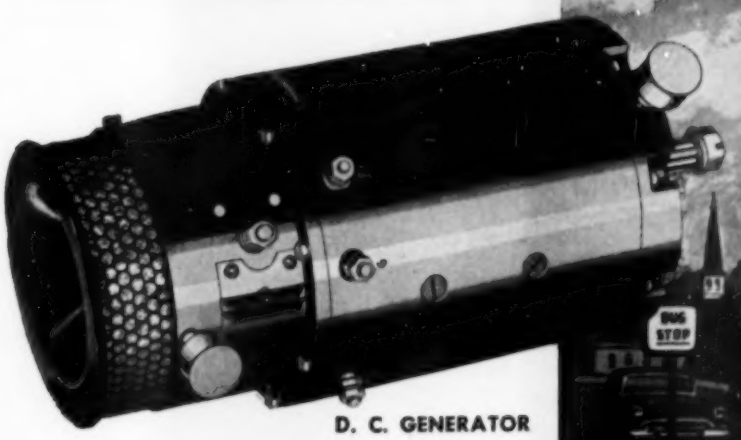
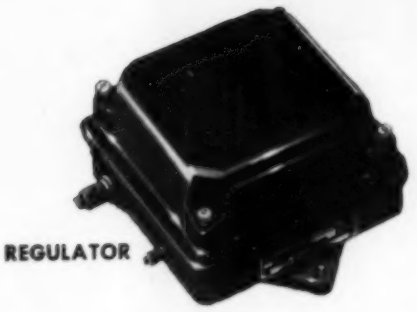


REGULATOR



D. C. GENERATOR



REGULATOR

WHEREVER WHEELS TURN OR PROPELLERS SPIN

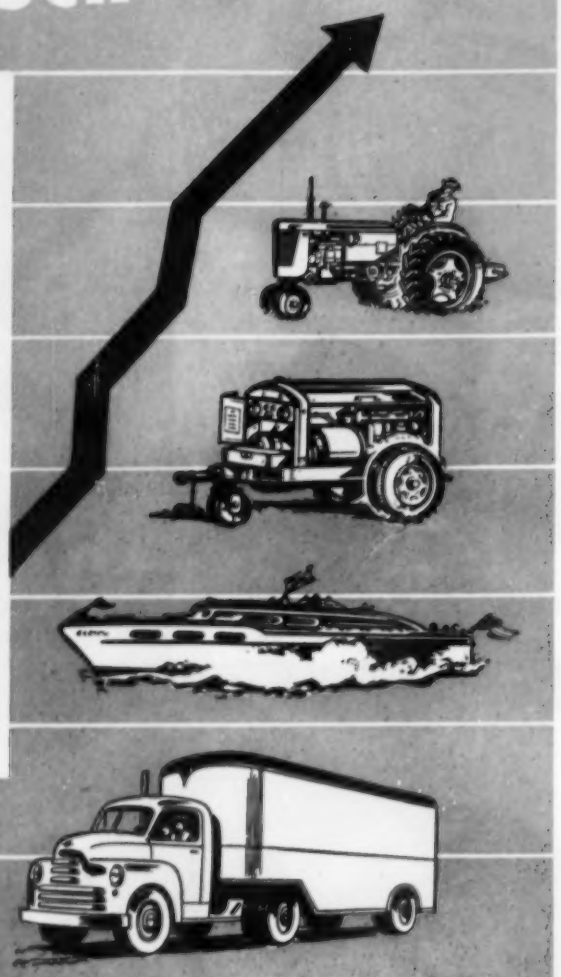
the UP and UP story on the AMERICAN BOSCH PSB!

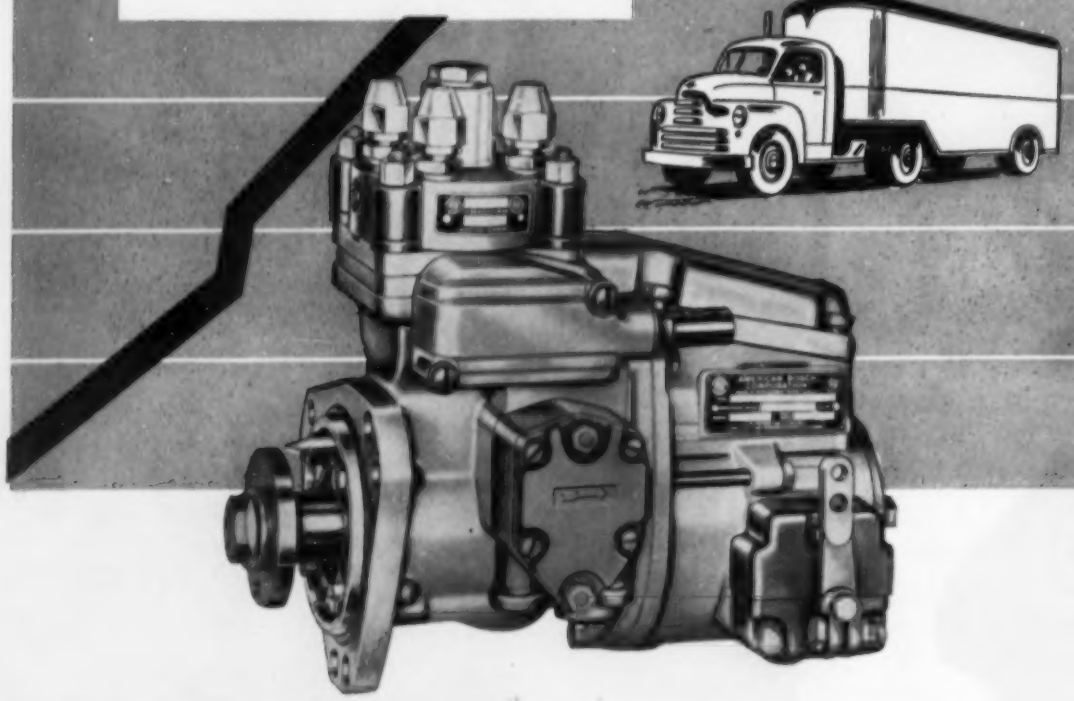
The introduction of the American Bosch "PSB" single-plunger distributor type fuel injection pump several years ago helped make smaller, lower-cost Diesels possible—and practical—for farm tractors, compressors, generating equipment, boats and trucks. Today, there are many thousands of PSB equipped Diesels in use, and their number is increasing at a rapid pace.

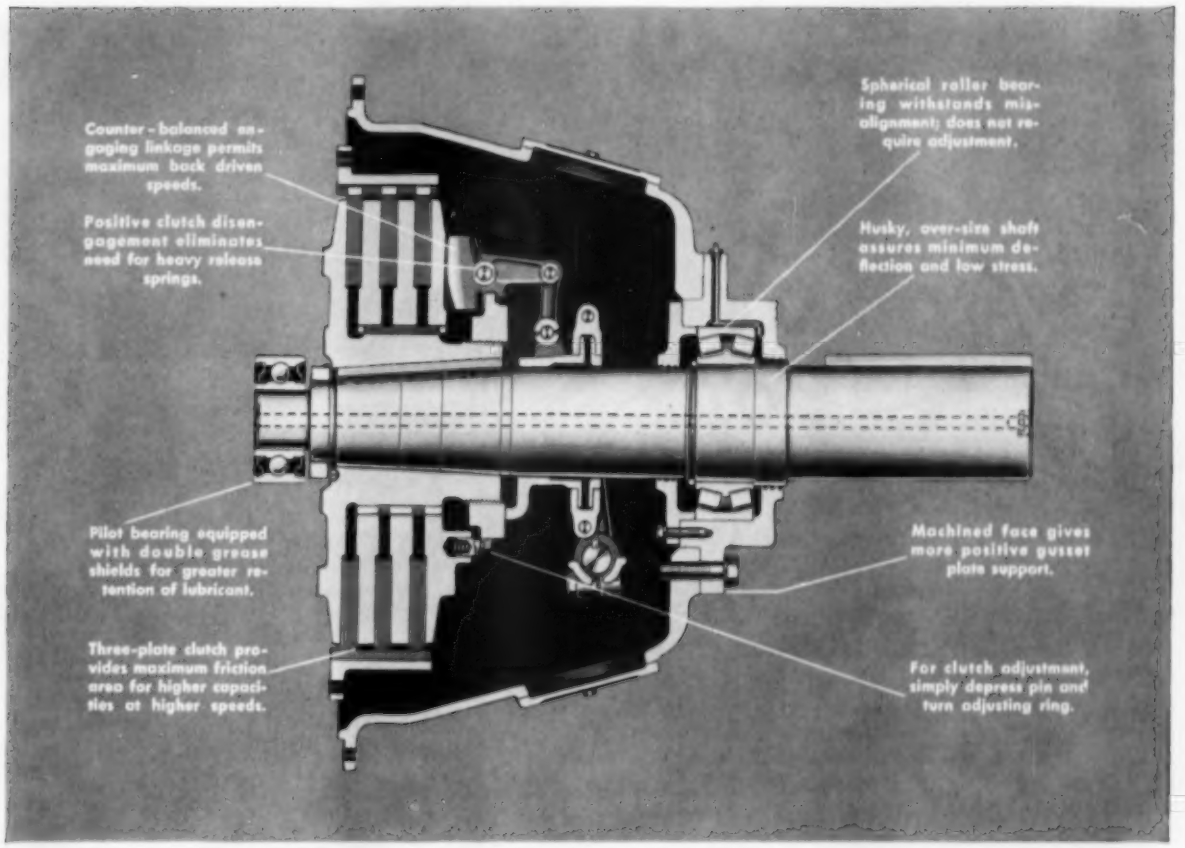
These simplified, compact pumps have an outstanding record for performance and dependability—assure users of long trouble-free service and low maintenance expense. No wonder production of American Bosch PSB pumps goes UP and UP month after month to meet the demand. American Bosch, Springfield 7, Massachusetts.

AMERICAN BOSCH

Division of
American Bosch Arma Corporation






Counter-balanced engaging linkage permits maximum back driven speeds.
Positive clutch disengagement eliminates need for heavy release springs.
Pilot bearing equipped with double grease shields for greater retention of lubricant.
Three-plate clutch provides maximum friction area for higher capacities at higher speeds.
Spherical roller bearing withstands misalignment; does not require adjustment.
Husky, over-size shaft assures minimum deflection and low stress.
Machined face gives more positive gusset plate support.
For clutch adjustment, simply depress pin and turn adjusting ring.

A new Power Take-Off for higher-speed, higher-horsepower engines

Here is the all-new Twin Disc Model SP-318 heavy-duty Friction Power Take-Off—designed and engineered especially to meet the extra requirements of the new engines in the 350 to 375 hp range, operating up to 1800 rpm.

Extremely compact for its capacity, the new Twin Disc Power Take-Off is provided with an S.A.E. #0 flywheel housing. With triple driving plate construction, it assures ample friction surfaces to withstand high horsepower loads. And with solid driving plates, the new PTO effectively permits higher safe permissible speeds.

The pilot bearing of the new Power Take-Off is composed of a single row of balls, operating in bearing races of double-row width . . . providing improved accommodation of minor misalignment inherent in installations of this nature. Pilot bearings of this type provide additional space for lubricant, which is more effectively retained by the double grease shield construction. Although this construction is usually referred to as "sealed for life," the clutch shaft is drilled to provide for relubrication of the pilot bearing in the usual manner.

Another outstanding feature of the new Twin Disc Power Take-Off is the use of a spherical bearing which does not require adjustment. With its inherent ability to permit angularity, the spherical bearing is more resistant to overload and destructive forces resulting from heavy side loads.

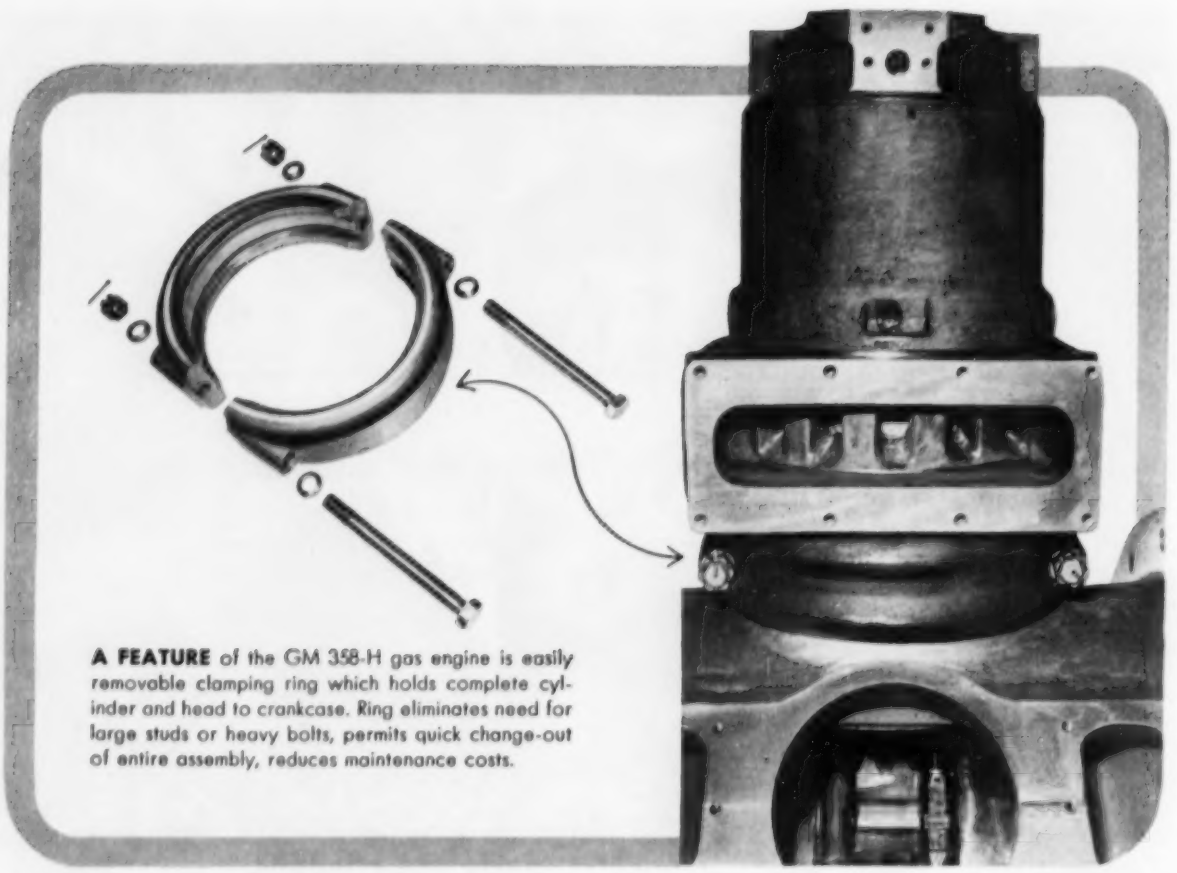
For complete information on the new Twin Disc SP-318 Friction Power Take-Off (and the SP-314, a smaller model of the same new design, for engines in the 225 hp range operating at 2200 rpm), write to the Twin Disc Clutch Company, Racine, Wisconsin.

TWIN DISC

TWIN DISC

Friction Clutches and Fluid Drives

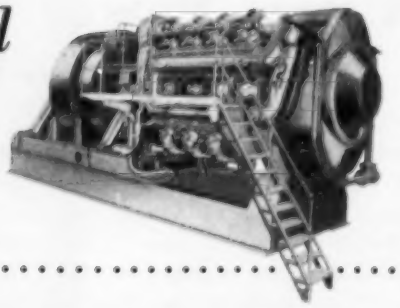
TWIN DISC CLUTCH COMPANY, Racine, Wisconsin
Hydraulic Division, Rockford, Illinois



A FEATURE of the GM 358-H gas engine is easily removable clamping ring which holds complete cylinder and head to crankcase. Ring eliminates need for large studs or heavy bolts, permits quick change-out of entire assembly, reduces maintenance costs.

Lightweight, medium-speed

pipeline power



The General Motors 3300-h.p. 358-H gas engine has features that make it your best buy for pipeline pumping power.

Light weight per horsepower, including attached accessories, reduces foundation requirements.

Freedom from vibration throughout its operating range also permits lighter foundations.

Medium-speed rating gives a lower step-up ratio speed increaser than is required by slower-speed engines.

Over-all dimensions are less than slower-speed engines in the same class. This means lower powerhouse building costs.

These are the features that will save you money in installation costs when you install a GM 3300-h.p. engine.

Full details and engineering specifications are yours promptly upon request.

General Motors 358-H **Gas Engine**

GM
CLEVELAND DIESEL

CLEVELAND DIESEL ENGINE DIVISION
General Motors
2160 West 106th Street, Cleveland 11, Ohio

BUILDERS OF DIESEL, DUAL-FUEL AND NATURAL-GAS-BURNING ENGINES—FROM 150 TO 3300 H.P.

THE ENGINEER'S REPORT

DATA

LUBRICANT RPM Delo Oil R.R.

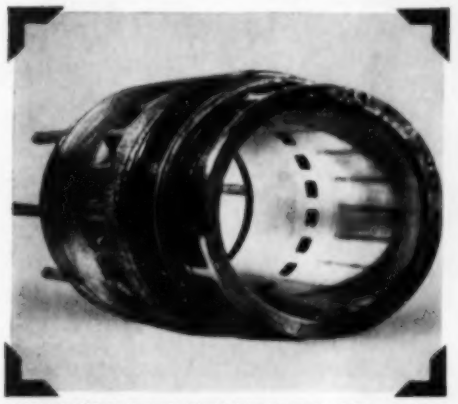
UNIT Diesel locomotive

SERVICE Mountain freight haul

CONDITIONS Long, continuous grades to 1.6%

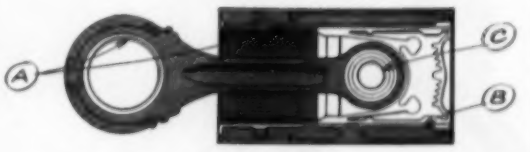
FIRM The Milwaukee Road

333,590 freight miles—only 0.0035 inch liner wear!



LUBRICATED WITH RPM DELO OIL R.R., this representative cylinder assembly was in good condition when pulled for regular inspection after 333,590 actual freight miles. Operation was on The Milwaukee Road's tough run between Othello, Washington, and Avery, Idaho. This liner, shown as it came from the engine, miked only 0.0035 inch wear, 0.001 inch taper, despite hard operating conditions—heavy loads, wide temperature variations, heavy grades, including one stretch of 20 miles of continuous 1.6 percent. Neither wristpin or bushing showed measurable wear.

How RPM DELO Oil R.R. prevents wear, corrosion, oxidation



A. Special additive provides metal-adhesion qualities...keeps oil on parts whether hot or cold, running or idle.

B. Anti-oxidant resists deterioration of oil and formation of lacquer...prevents ring-sticking. Detergent keeps parts clean...helps prevent scuffing of cylinder walls.

C. Special compounds stop corrosion of any bushing or bearing metals and foaming in crankcase.

FREE CATALOG: "How to Save Money on Equipment Operation," a booklet full of valuable information, will be sent you on request to Standard Oil Company of California, 225 Bush St., San Francisco, Calif.

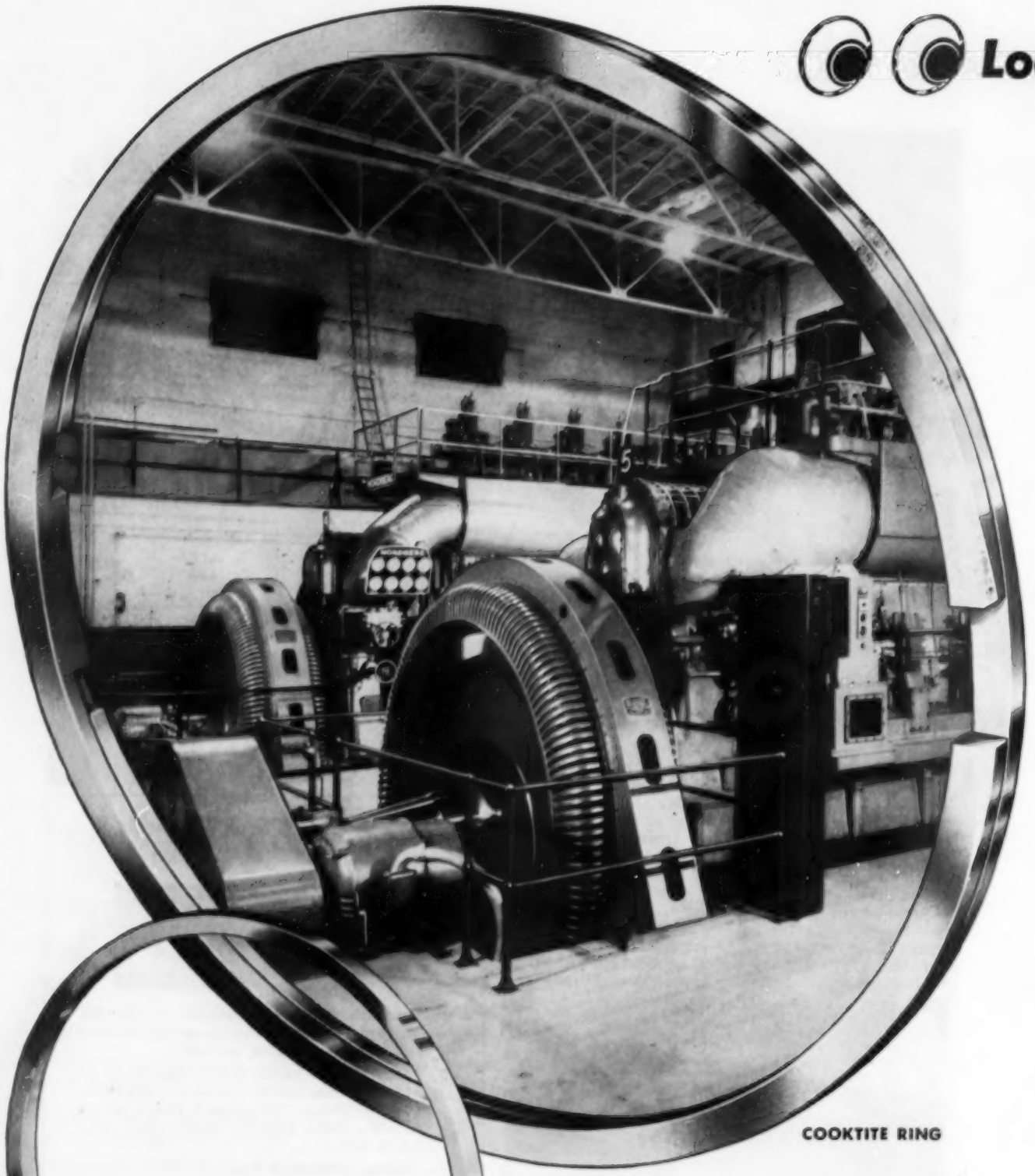
RPM DELO LUBRICATING OILS

FOR MORE INFORMATION about this or other petroleum products of any kind, or the name of your nearest distributor handling them, write or call any of the companies listed below.

TRADEMARK "RPM DELO" REG. U.S. PAT. OFF.

STANDARD OIL COMPANY OF CALIFORNIA, San Francisco 20 • STANDARD OIL COMPANY OF TEXAS, El Paso
THE CALIFORNIA OIL COMPANY, Barber, New Jersey • THE CALIFORNIA COMPANY, Denver 1, Colorado

Look



COOKTITE RING

TYPE 101 RING

RE-TURNING MAKES BETTER RINGS!

Because they are re-turned as a final manufacturing process, Cook Piston Rings are light-tight, and conform perfectly to the cylinder wall. This eliminates the possibility of scuffing during initial operation. The perfect conformity of re-turned Cook Rings prevents hot gases from blowing by and impairing lubrication when it is needed most. The result — *longer life and — more efficient performance!*

to **COOK** *for* ***Better*** *Rings!*

372.2% More Operating Time Between Ring Renewals!

That's Bryan, Ohio's Experience With Cook Piston Rings!

THE 3600 HP Diesel engines on the opposite page are two of several large-bore units generating electricity for a municipal power plant — the Bryan Light & Water Works, Bryan, Ohio. Altogether there are four engines, totalling 9600 HP.

Before being equipped with Cook Plain and Cooktite Sealing Rings, these engines had been averaging only about 1750 operating hours between complete ring renewals. But look what happened under similar operating conditions, when Cook Piston Rings were installed. *Compare operating hours, cylinder wear and ring breakage — "before and after"!*

As you'd expect, this operator has now standardized on Cook Rings, exclusively, for all four engines!

If you're looking for a seal with the savings built in, mail the coupon today for product information, and the name of your nearest Cook representative.

	FORMER RINGS	COOK RINGS	% CHANGE
Average Operating Time Per Piston Pulling For Ring Inspection	1750 Hours	3500 Hours	+100.0%
Average Operating Time Between Complete Ring Renewals	1750 Hours	8265 Hours	+372.2%
Maximum Average Cylinder Wear Per 1000 Operating Hours	.0065"	.0031"	− 52.3%
Average Number of Broken Rings, Per Engine Set	9 Per 1750 Operating Hours	1½ Per 6500 Operating Hours	− 95.5%

C. LEE COOK COMPANY

Sealing Pressures Since 1888

C. Lee Cook Co.
982 South 8th Street
Louisville 3, Kentucky

Gentlemen: Please send me complete information on Cook Piston Rings and name of nearest representative.

Firm _____

Street _____

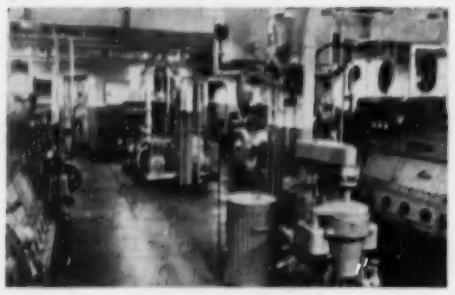
City _____ State _____

Attention _____

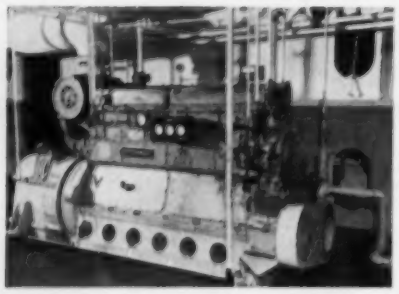
Type of Units _____

Smooth clean lines and unusual design distinguish the "Mokuhana." Her two turbocharged, 6-cylinder diesels efficiently drive her with maximum load of 575 tons of sugar at an average speed of 10.8 knots.

"Mokuhana" ends first year's C & H Sugar run with record: not a single work day missed!



The two Model DMM-36 Enterprise true right and left hand engines assure well balanced power for vibration-free operation at all speeds.



Uncluttered, easy inspection access is readily provided by Enterprise Diesels, which are rated 400 HP at 800 RPM.

Remote operating console proves simplicity and ready adaptability of engines to centralized control.

This special service 178 foot cargo vessel really earned her name last year. An Hawaiian word meaning "work boat," the "Mokuhana" turned in an unbeatable performance record for her owners, Bay & River Navigation Co., San Francisco. Says operating manager, C. E. Luddy: *"During the year's busy operation in water transportation service for C & H Sugar Co. and its customers, we have not had a moment's trouble. The vessel has not missed a single working day. There has been no down time. Her main propulsion Enterprise Engines have performed in regular, full operation with smooth dependability."*

This same story is repeated year after year in boats of all types and sizes powered by Enterprise models from 73 to 6150 HP. Get all the facts today. Contact the experienced Enterprise sales engineer in your area, or write us direct about your problem.

Cargoes of California & Hawaiian Sugar were delivered on close schedules with unfailing Enterprise power throughout the first year's operation.

Over a million horsepower at work the world over!

ENTERPRISE dependable ENGINES

THE SWITCH IS TO ENTERPRISE
CHOICE OF POWER EXPERTS

ENTERPRISE ENGINE & MACHINERY CO. • Subsidiary of General Metals Corporation • 18th and Florida Streets, San Francisco 10, California

Boston • Chicago • Denver • Jacksonville • Kansas City • Los Angeles • Minneapolis • New Orleans • New York • San Diego • Seattle • St. Louis • Washington, D.C

NEW STANODIESEL OIL M

A new stationary industrial engine lubricant developed specifically to meet problems posed by new engine designs, higher loads, economy fuels

New STANODIESEL Oil M meets—and with plenty to spare—the performance requirements imposed on diesel lubricants by new engine designs, higher loads and the use of economy fuels. It meets these requirements because, first of all, it is an oil refined from the finest quality base stocks. It thus has superior stability. Then additives exclusive with STANODIESEL Oil M have been blended with these base stocks. The additives do these things:

1	**INHIBIT OXIDATION.** Prevent unwanted increases in oil viscosity. Prevent corrosion of bearings.
2	**PROVIDE DETERGENT-DISPERSANT ACTION.** Keep crankcase, pistons, cylinder walls and other parts clean. Keep contaminants in suspension, prevent redeposit.
3	**PROVIDE ANTI-FOAM ACTION.** Foaming tendencies of oil are controlled. Oil is suitable for use in hydraulic governors.
4	**INCREASE LUBRICITY.** Wetting agent increases oil's ability to reach and maintain a film on highly stressed parts.

STANODIESEL Oil M is a "Mil" type oil.

Your next move? Find out how STANODIESEL Oil M can serve you. In the Midwest call your nearby Standard Oil lubrication specialist. Or contact Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.

STANODIESEL OIL M
Does these things for your engine

1. Lessens engine deposits, ring and cylinder wear.
2. Lessens spark plug fouling.
3. Lessens fuel injector and pump sticking resulting from engine deposits.

STANDARD

STANDARD OIL COMPANY (Indiana)

Florida East Coast

nears complete dieselization with 28 new GM units

Standardizing on General Motors Diesel locomotives is the best investment a railroad can make because, in addition to their well-known operating efficiency, interchangeability of mass-produced parts insures ready availability—less down-time—lower maintenance costs.

More than 16,000 General Motors Diesel locomotive units are earning money for railroads on six continents

La Grange, Illinois • Home of the Diesel Locomotive GENERAL MOTORS LOCOMOTIVES *In Canada:* GENERAL MOTORS DIESEL, LTD., London, Ontario

ELECTRO-MOTIVE DIVISION · GENERAL MOTORS

A New PM TOOL for Diesel and Gasoline Engines

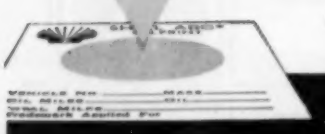
SAVE Time, Money, Oil and Engines with the Shell ADC* Oilprint Analysis

Now—operators can test crankcase oil in the short time allotted for re-fueling and oil level checks. The Shell ADC Oilprint Analysis gives a practical and accurate oil evaluation in minutes.

ADC Oilprint Analysis means big savings when used in your preventive maintenance program . . . gives valuable information on engine and oil conditions. It answers the question "When do I change my oil?" thus eliminating the draining of usable oil and the risk of using oils loaded with contaminants.

See for yourself how the new Shell ADC Oilprint Analysis can save you real money in preventive maintenance. *Trademark

Let us demonstrate how you can use this Service for Your Equipment



SHELL OIL COMPANY

50 WEST 50TH STREET, NEW YORK 20, NEW YORK
100 BUSH STREET, SAN FRANCISCO 6, CALIFORNIA

SHELL

GM DIESEL
CASE HISTORY No. IIEIC-23

BOAT AND OWNER: 40-foot tug GERRY D. owned and operated by Duntap Towing Company, La Conner, Washington.

INSTALLATION: GM "6-110" 2-cycle Diesel replaced 4-cycle Diesel. Turns 45" x 27" propeller through 3:1 reduction.

PERFORMANCE: The switch to smaller, lighter, more compact GM Diesel doubled boat's power, gave extra speed for heavier tows. Tug now rides 6" higher in water. Captain Mike O'Leary says, "Extra power gives us an extra hour to work when tide is running hard."

Gets an extra hour's work per day

Since He Switched to General Motors 2-Cycle Diesel Power

Installing a General Motors "6-110" Diesel engine gave the tugboat "GERRY D" twice the power it formerly had in an engine that is actually lighter and takes up less room. As a result the tug also gets more work done and is more maneuverable. The GM "6-110" Diesel answers controls faster, accelerates quicker because of its 2-cycle "power on every piston downstroke" design.

If you're thinking of buying a new boat or repowering your present one, why not specify GM Diesel engines? You'll find they are smaller, lighter engines that fit where other Diesels won't; give you extra hold space for fuel and water tanks—extra living space for your crew.

GM Diesels cost less to maintain, too. For example, GM Diesel valves cost up to 62% less and cylinder liners up to 40% less than the same parts for other comparable Diesel engines.

Your local GM Marine Diesel distributor can give you complete details on GM Diesel power for your boat. Call him in today for the whole story or write direct for more information.

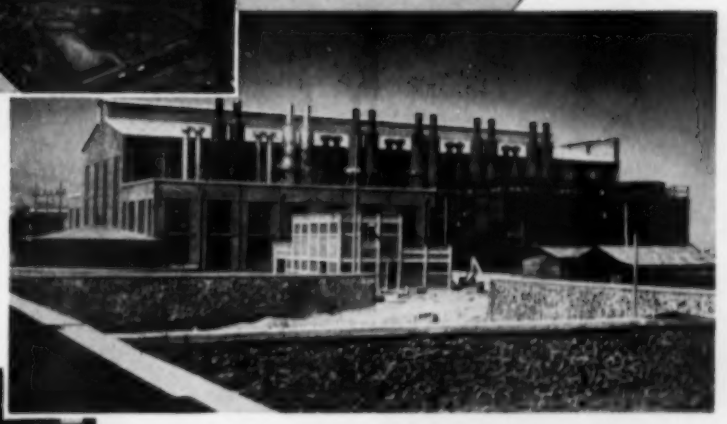
DETROIT DIESEL ENGINE DIVISION
GENERAL MOTORS • DETROIT 28, MICHIGAN
Single Engines... 30 to 300 H. P. Multiple Units... Up to 893 H. P.

GM
GENERAL MOTORS
DIESEL POWER

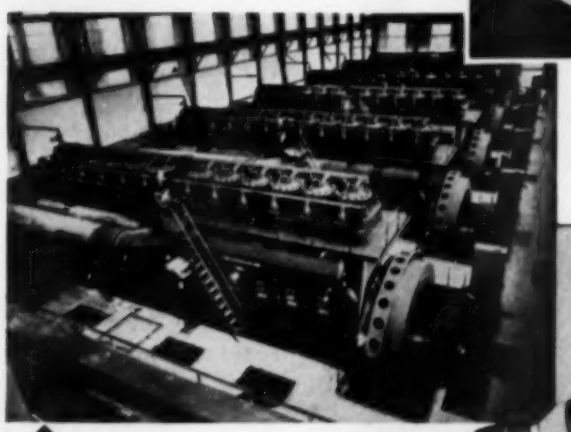
Sales, Factory-Engineered Parts and Authorized Service through distributors and dealers in all important marine locations. SEE your local Telephone Classified Directory or write, wire or phone for name of nearest Distributor.

MEXICO CITY POWER PLANT *at* TACUBAYA

Here is an excellent aerial view of Mexico City's modern new municipal Power Plant at Tacubaya. Supplying dependable electric power to the Mexico City area. Six modern Nordberg diesels have been installed to drive the huge generators.

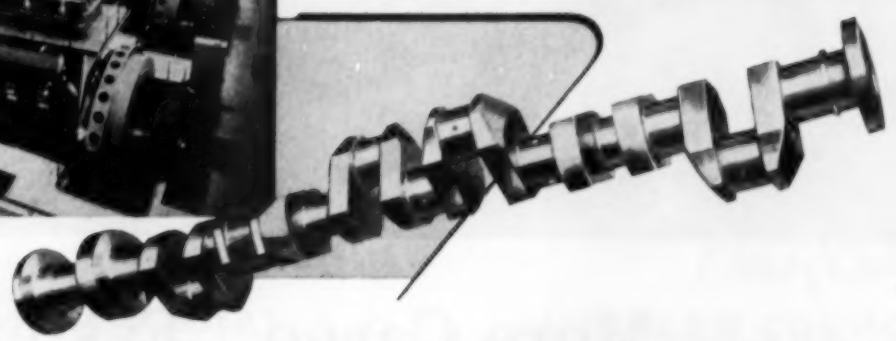


Another view of the installation showing the central power station. The most modern, efficient equipment available was used in the construction of this unit.



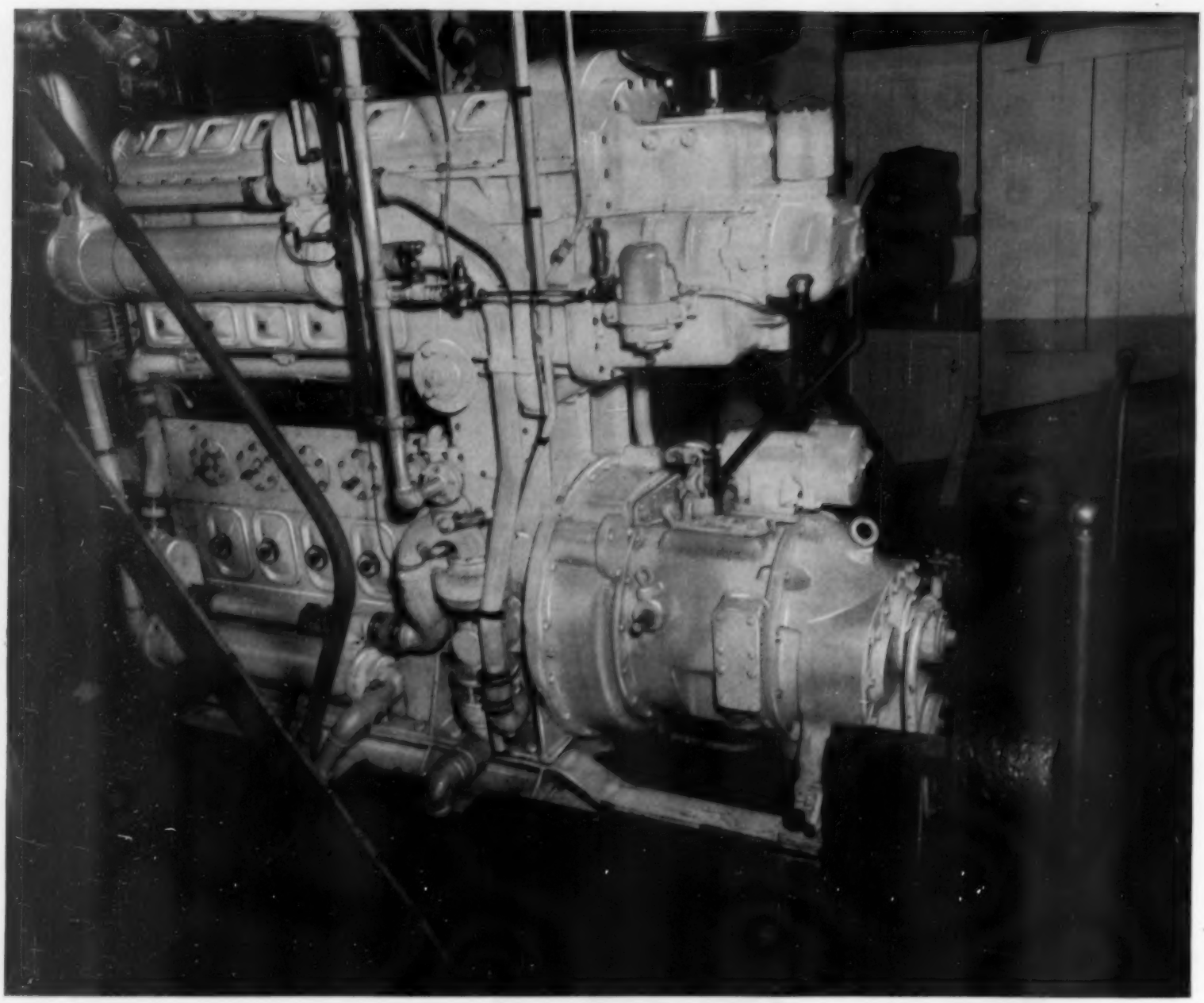
Illustrated here is the battery of six huge Nordberg diesels which supplies the power driving the generators . . . smooth, vibrationless power for years to come.

"ERIE CRANKS... The Giant in the Diesel"



Erie Forge, too, is proud of its small part in the modern Tacubaya installation. Erie cranks are used by Nordberg in these efficient diesel engines. Two sections of Erie Cranks as illustrated are used in each Nordberg diesel, each section weighs 58,382 lbs. The starting weight of each ingot was 214,500 lbs. Each section measures 30' 10" in length. Perfectly machined with a watchmaker's precision, Erie Cranks . . . The Giant in the Diesel.

ERIE FORGE & STEEL CORPORATION
ERIE, PENNSYLVANIA



More Cargo...Faster with an Opposed Piston Engine

Listen to what "Repowering with O-P" has done for the motor tanker, *Lucy*.

Her 375-horsepower Model 38F Opposed Piston Diesel weighs 34 tons less than the engine replaced—that's equivalent to more than 200 barrels' capacity that can be added every trip without affecting her design characteristics.

And her speed has been increased 25%, making it possible to increase the number of revenue trips per month. In addition to increased cargo and speed adding to *The Lucy's* earnings, the Opposed Piston's 7% lower fuel oil consumption adds a bonus saving.

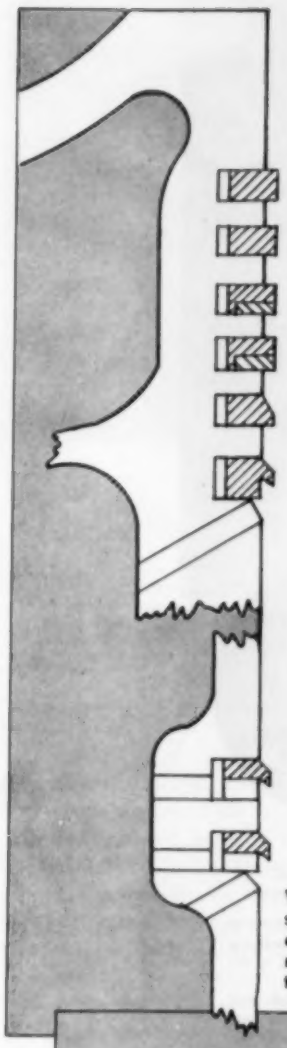
Increased earning capacity and proved low maintenance established by more than 6 million installed horsepower is proof of what an O-P engine can do for your boat. See your nearby Fairbanks-Morse Marine Specialist and ask about the Opposed Piston engine that fits your repowering needs from 200 to 1200 horsepower. You'll find out the full meaning of *Better* Power for You . . . with an Opposed Piston Diesel Engine. Fairbanks, Morse & Co., 600 South Michigan Avenue, Chicago 5, Illinois.

FAIRBANKS-MORSE

a name worth remembering when you want the best

DIESEL AND DUAL FUEL ENGINES • DIESEL LOCOMOTIVES • RAIL CARS • ELECTRICAL MACHINERY • PUMPS • SCALES • HOME WATER SERVICE EQUIPMENT • MOWERS • MAGNETOS

SAVE FUEL...
up to 15% with DaRoS Piston Rings



View of piston cross-section showing ring application as recommended by DaRoS, in typical 4 cycle Diesel.

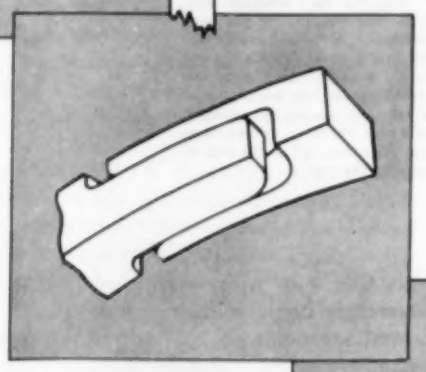
Here Are the Three Basic Reasons Why Users of DaRoS Rings Save 10% to 15% on Fuel!

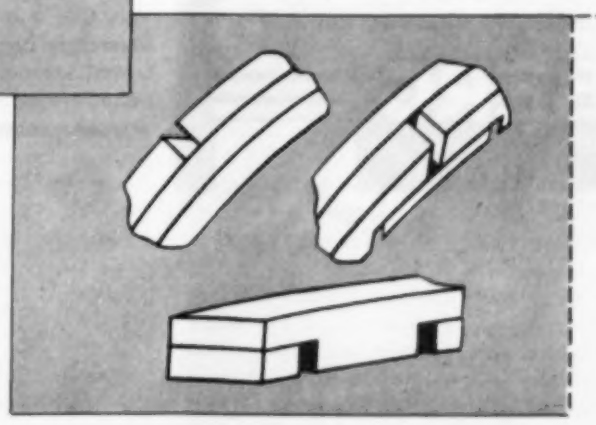
1. DaRoS Rings do *not* leak—there's no blowby—no compression leakage—no loss of efficiency when you use DaRoS leakproof Sealing Rings. They successfully seal—in both new and worn cylinders. Typical DaRoS application on left shows how you can reduce compression loss—increase efficiency—save fuel up to 15%.

2. DaRoS Rings—made of Swedish Charcoal Iron—out-wear others—have a lower rate-of-wear—50% to 90% on rings and cylinders!

3. DaRoS Rings are made by Davy Robertsons Maskinfabrik — the world's first manufacturer of commercial piston rings. DaRoS furnishes original factory equipment to many of the leading engine builders. Over 50% of all of the motorships (above 1000 ton capacity) throughout the entire world are fitted with DaRoS Piston Rings.

Reduce your fuel costs NOW by installing DaRoS Rings in all of your engines —wire—write or phone for prices.





ABOVE. View of DaRoS ONE-PIECE Sealing Ring #201 recommended for new cylinders. RIGHT. View of DaRoS TWO-PIECE Sealing Ring #206 recommended for worn cylinders.

(This is ad #5 in a series designed to tell Diesel Operators the important story about DaRoS Swedish Iron Piston Rings.)

IMMEDIATE DELIVERY

... from Chicago on popular sizes for Industrial Engines

DaRoS

AMERICAN CORPORATION

D. D. COOK, President

8128 N. Lawndale Avenue
Skokie (Suburb of Chicago), Illinois U.S.A.
Distributors for North, Central and South America

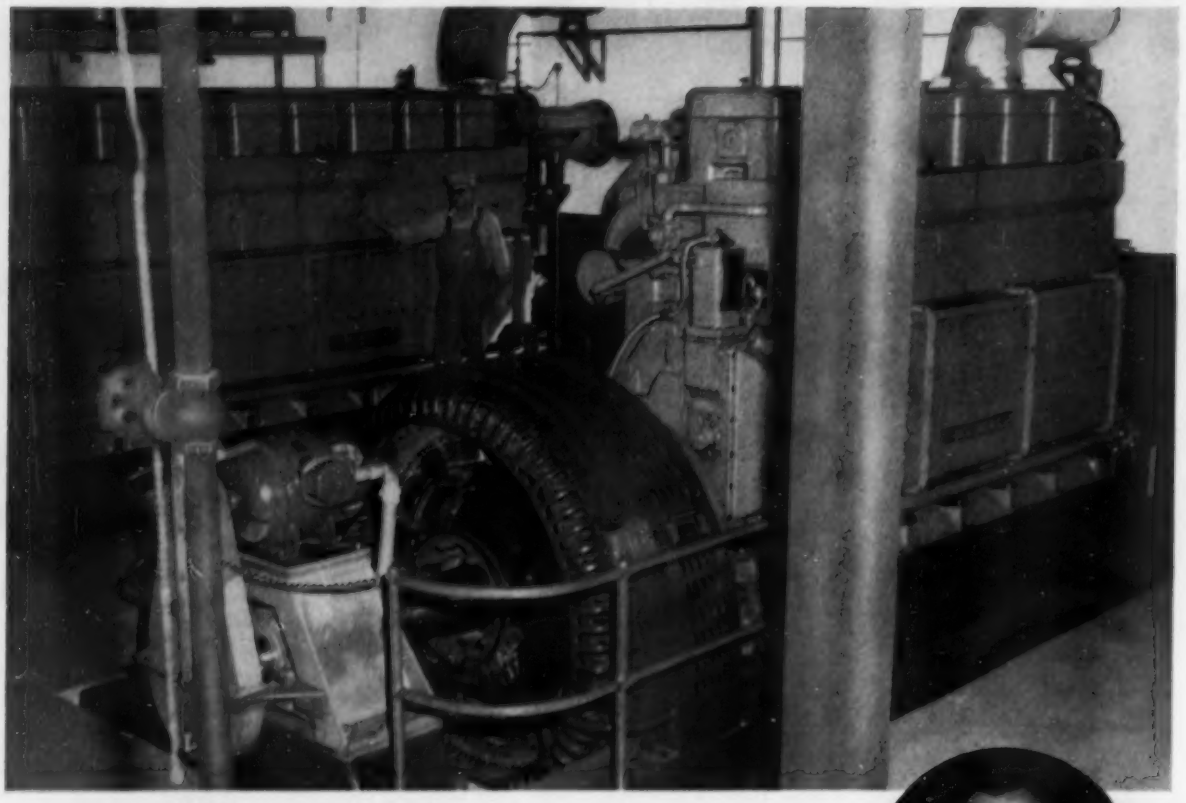
DaRoS American Corporation
8128 N. Lawndale Ave., Skokie, Illinois
Gentlemen: Send me complete information on DaRoS Rings.

NAME_____

FIRM NAME_____

STREET ADDRESS_____

CITY_____ STATE_____



KINGFISHER, OKLAHOMA . . .

Another Municipality Profits by Installing NORDBERG Duafuel® Engines

● The growth pattern of the progressive City of Kingfisher is similar to many municipalities operating city-owned utilities. Starting at the turn of the century with a 125 kw steam engine operating for night lighting, the plant was expanded with steam engine and turbine power until a capacity of 1750 kw was reached in 1954.

To improve service and increase the efficiency and economy of the plant, the city then installed two new Nordberg Duafuel engines—a 1420 hp, 1000 kw, *Supairthermal*® unit, and an 847 hp, 600 kw, supercharged unit, both operating at 450 rpm. Now this modern plant has a total capacity of 2600 kw . . . 1600 kw from the Duafuel engines, and 1000 kw from a steam turbine.

Since the two Nordberg engines were installed, they have carried the full plant load, with no down time, and with substantial savings in operating costs. During the last half of 1954 over 3,000,000 kwh were generated at a cost of 6.4 mills per kwh—as compared to a cost of 9.5 mills per kwh which would have been required by the steam turbine—further proof of the economy and dependability of Nordberg power.

NORDBERG MFG. CO., Milwaukee, Wisconsin

Mr. C. A. Garrett,
Plant Superintendent,
City of Kingfisher, Oklahoma

● Here's what Mr. Garrett has to say about the two Nordberg Duafuel engines installed in the Kingfisher plant:

"We are very pleased with these engines, and in the way Nordberg has worked with us. We feel that our plant is a great asset to Kingfisher, and the Nordberg engines are giving us a very nice saving in operating cost over steam . . . in fact, they pay for almost all of the cost of running the city."

NORDBERG
DIESEL • DUAFUEL® AND SPARK-FIRED GAS ENGINES

© 1955, Nordberg Mfg. Co.

BUILDERS OF AMERICA'S LARGEST HEAVY DUTY ENGINE LINE . . .
10 to over 12,000 HORSEPOWER

P555

Since 1946, work has been in progress building Westlake, a city within a city, on the shore of the Pacific Ocean, south of San Francisco. The camera was pointed toward the Golden Gate. On the skyline at extreme right can be seen the towers of the Golden Gate Bridge.

HENRY DOELGER BUILDS WITH DIESELS

By KENNETH R. MACDONALD

ONCE upon a time, the construction of a home was a comparatively simple business. The home-builder could "stick to his last" and be a specialist in just one field of endeavor. Today, however, the home-builder must be expert in many fields which range far from the actual construction of homes. The home-builder who remains successful in this highly competitive business must possess a sound fund of knowledge on an amazing variety of subjects from labor negotiations to cost control and economic research. He must be much more than a home-builder, and, in many instances, is the planner and builder of whole new cities.

Such a home-builder is Henry Doelger, whose nationally known firm is now constructing the $135,000,000 Westlake development where nearly 40,000 people will eventually live in 8000 private homes and 2100 ultra-modern apartments on a 2000-acre tract, 15 minutes from downtown San Francisco. Doelger earned his first $300 as a youngster, selling sash-weights which he salvaged from the 1906 San Francisco earthquake and fire. He began his career when the home building business was small and simple. In the 30 years he has been building homes in California, he has become a spectacular and colorful legend and has constructed more than 11,000 homes in San Francisco alone. Probably as many as 50,000 people now live in Doelger-built homes, with more moving in daily.

"When I started in this business," Mr. Doelger declared, "our equipment was wheelbarrows, saws, and hammers. For power, we had horses, and our own strong backs and arms. Builders were considered pretty big and successful if they constructed 10 new homes a year! And home ownership in those days was enjoyed by comparatively few. The reason was the high cost of construction which was almost entirely a hand operation."

In the intervening years, Mr. Doelger has seen his business grow to the point where today's "merchant builders" think nothing of constructing 10 or 20 thousand homes a year. In his opinion, this radical change was brought about by mechanization of the industry and the application to home building of the advantages inherent in the use of diesel engines.

"While slow-speed stationary diesels had been used for many, many years, when I began building homes," Mr. Doelger said, "we didn't have the small, high-speed automotive type diesels which now are helping builders all over the country to get more work accomplished, faster and cheaper than ever before."

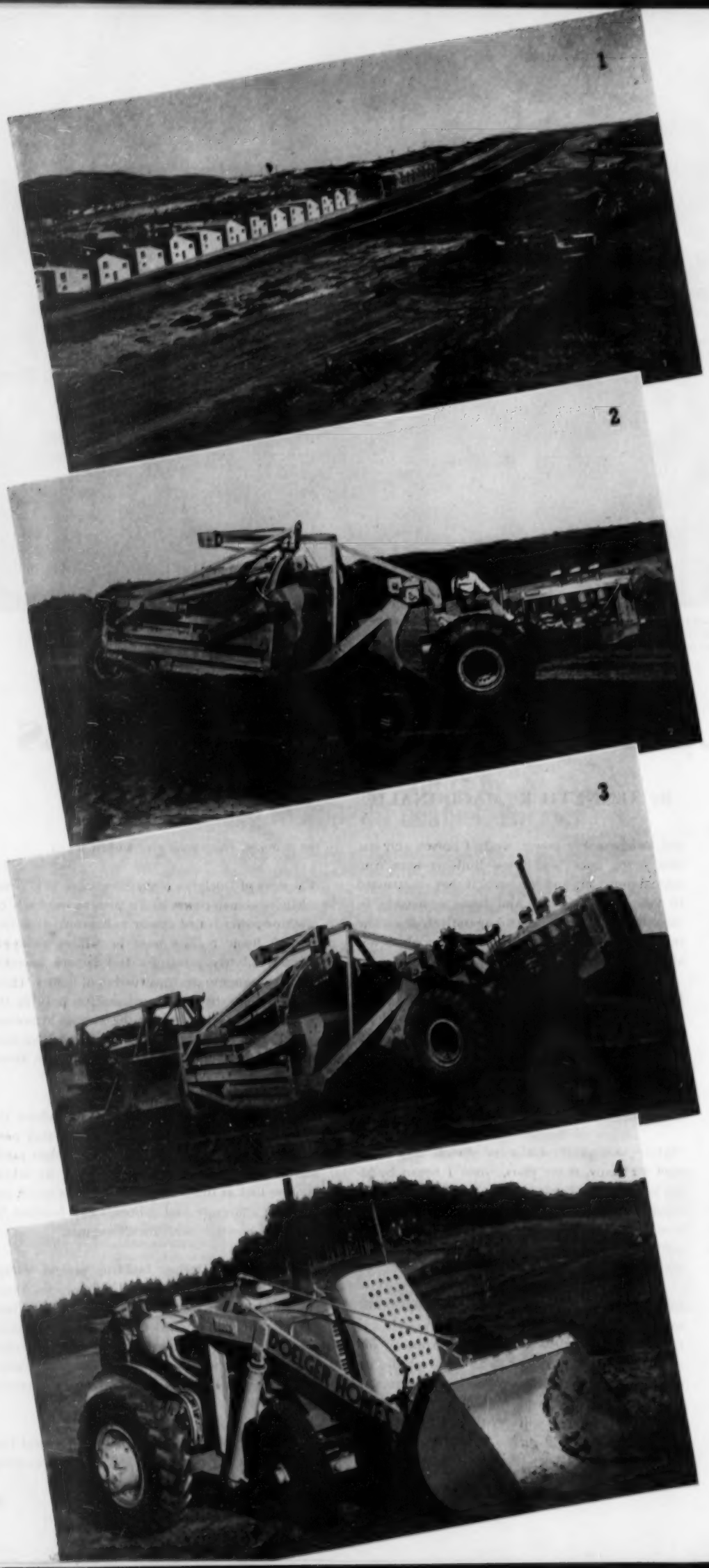
Complete mechanization of the Doelger operation, using diesel engines extensively for power, has resulted in greater efficiency, greater economy and greater profits, according to this giant of the industry who now is building homes at the rate of almost 10 a day. He has such great faith in the productive capacity of machinery that he has invested more than $2,000,000 in the 200 pieces of rolling stock with which Henry Doelger Inc., is now building a model residential city within a city.

The story of Doelger's conversion, since 1946, from reliance on man-power to his present emphasis on machine-power is tied closely to his conviction that "today's home builder must be willing to apply business-industry principles and factory assembly line techniques to the construction of homes. These principles and techniques are making possible the building of fine homes that the average American can afford to buy; homes which could not have been built for comparable prices by using mules, steam or manpower."

Not all home builders, of course, can afford the investment in heavy equipment, nor do they need the great variety to be found in the Doelger yards. Many builders, however, are profiting by taking another look at those of their operations which can be more efficiently and economically handled by machines powered with diesel engines.

Until 1946, the Doelger building process, except for the unusually high annual volume, was much the same as other home builders. Tract and land preparation was assigned to outside specialists on a contract basis, and practically all of the actual home building was the typical on-the-site construction, with as many workmen as necessary swarming over the job.

"It seemed obvious to us at the end of World War II," Mr. Doelger explains, "that the home building



boom not only would go on, but undoubtedly would become even greater. We were certain that we could build better homes, and sell more of them at lower prices, if we could increase our efficiency and cut down our costs. It also seemed obvious to us that mechanization and a switch to dieselized equipment was the best possible way to accomplish these objectives."

Mr. Doelger began construction of Westlake in 1949, on hilly, rocky land where artichokes once were the only commercial crop possible. Today, by using equipment which includes everything from a motorcycle to huge earthmovers, he builds 12 to 15 million dollars worth of homes a year. Since the project was launched, more than 15,000,000 cu. yds. of earth have been moved to make way for home sites. An additional 10,000,000 cu. yds. will be moved before the project is completed.

"In addition to constructing homes, apartments and a $25,000,000 regional shopping center," explains W. A. Buck, who, with "Whitey" Jeppesen, supervises mechanized equipment, "we also do all of the heavy construction work which normally is carried on by road-building contractors. We handle our own earth removal, with hauls averaging between 1800 and 4200 ft.; we do the grading; lay out all of the sewers and drains; build all of the streets; and, with our own crews and our own equipment, we take care of every aspect of site improvement and community development."

The investment in heavy equipment is much greater than home and commercial builders normally are willing to make, Mr. Buck is quick to admit. However, he points out, on a community project as vast as Westlake, such expenditures are easily justified because the builder profits in proportion to his volume of production. "If we can speed production without in any way lessening the quality of the construction," Mr. Buck declares, "we can build more houses at a lower cost. The greater the sales volume, proportionately, the greater the profit. At the same time, when our costs are lowered, more people are enabled to purchase their own homes."

Mr. Buck also is convinced that dieselization "introduces a factor of known reliability" in contrast to other types of power. Also, prior to mechanization and even as late as 1951, much work was done by hand labor. Since mechanization, Doelger executives agree that the work is now being performed for 10 to 15% of the former cost.

Doelger's $2,000,000 in equipment and rolling stock consumes 1400 gallons of diesel fuel and 800 gallons of gasoline per day,—varying somewhat in accordance with the volume of activity. The dieselized

1. Henry Doelger found that diesel engines help achieve volume production of homes selling from $12,275 to $25,000. 2. Twelve pieces of Caterpillar equipment help attain high volume. 3. Doelger builds whole communities, not merely homes. 4. One of Doelger's four scoop loaders is powered by a Caterpillar diesel and he is eager for inexpensive diesels to become available for similar lighter types of equipment.

equipment includes: 12 Caterpillar tractors of various sizes; 13 Allis-Chalmers TS-300 motor scrapers, powered by Buda diesels with three extra engines; 7 A-C HD-20 and 1 HD-9 tractors, powered by Detroit GM diesels with one extra engine; 3 swing cranes, two powered by International Harvester diesels and one Cat engine; and one scoop-loader powered by a Caterpillar D4. Other semi-heavy-duty gasoline-powered units include: 4 Ford tractor-drawn loaders; seven lumber carriers; 3 fork-lift trucks; 2 trenchers; and three water wagons of 2000-to-5000-gal. capacities. "One of these water wagons," Mr. Buck explains, "we built right here in our own shop. Had we gone out and purchased it, the wagon would have cost us $40,000 at least."

Almost 800 people are regularly on the Doelger payroll and at least 150 of these work full-time and exclusively on the rolling stock and heavy equipment. The service shop has six to 10 mechanics on duty at all times, plus three welders, three helpers and four oilers.

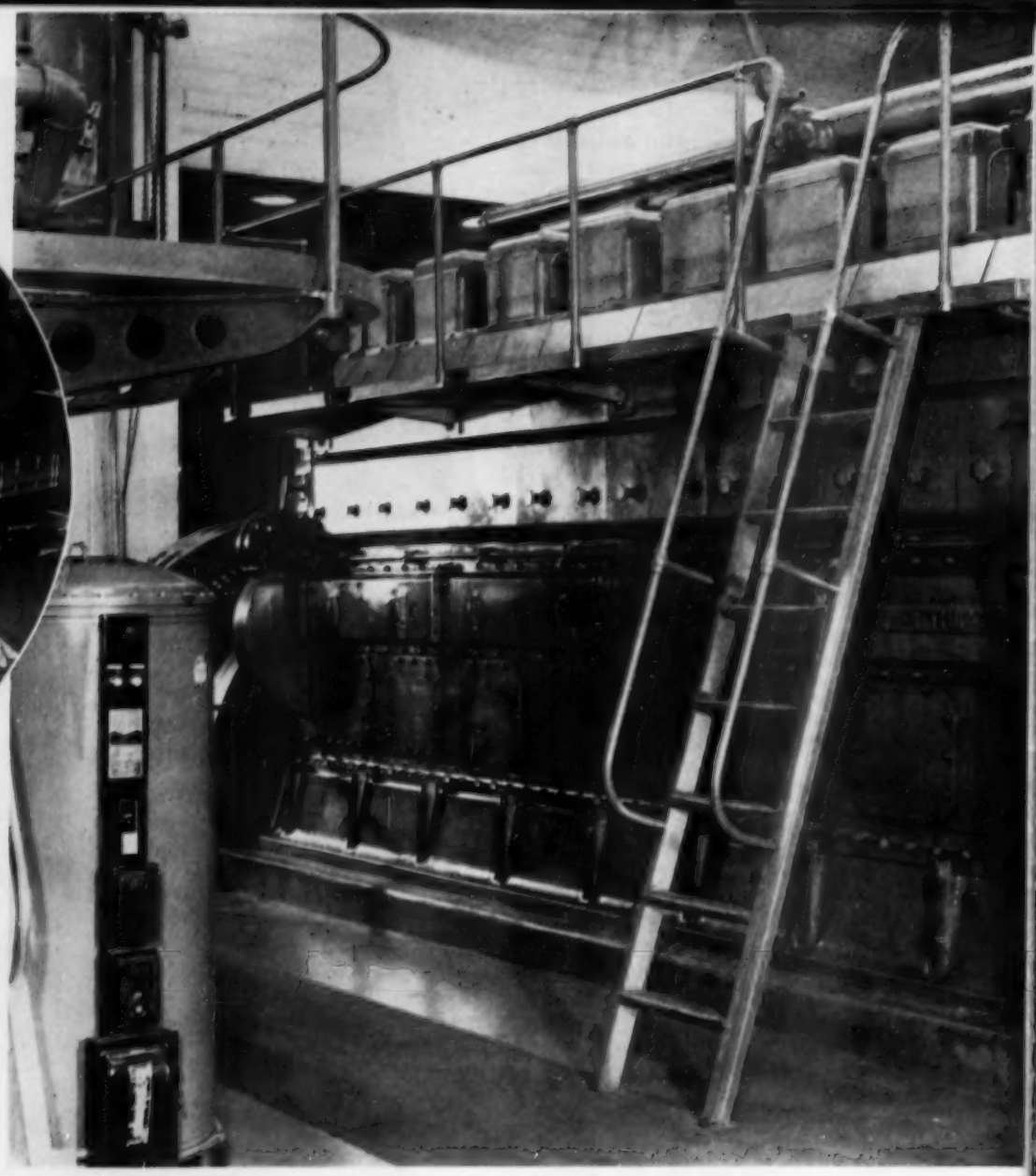
"In 1953," Mr. Buck says, "we spent more than $600,000 on new equipment and last year we spent an additional $500,000, as well as thousands of dollars on maintenance and repairs." The service shop maintains a $30,000 to $40,000 inventory of parts.

Although Mr. Doelger is highly enthusiastic over the results of the mechanization program, and is particularly pleased with the economy and efficiency of the diesel engines used, he warns that builders "should invest in such heavy equipment only after careful study of the work to be performed." He says, for example, that he has not standardized on any single engine "because I'm convinced that various diesels perform best on certain kinds of jobs. We try to use the engine best suited for the specific job. Much of our building is entirely dependent upon cuts and fills, working in clay, blue shale, gumbo and drift sand. For this kind of work, where real power is required, we use the A-C hydraulic torque converter drive tractors. They turn in a job that would do justice to any construction company engaged in the largest kind of a reclamation project. They give us power when and where we need it, with complete efficiency, ease of operation, and economy of maintenance.

"The only kind of diesel power that seems to be lacking," Mr. Doelger concluded, "is an efficient, economical, and comparatively inexpensive diesel for our lighter construction equipment. If such diesels were available, we'd convert tomorrow to the use of diesels on all of our lighter equipment now powered by gasoline engines. Personally, I think that in view of the developments of the last 25 years my hope is not too far from the possibility of fulfillment."

5. Officers of Henry Doelger, Inc., San Francisco, are: (left to right) John Doelger, vice-president and general manager; Henry Doelger, president; Alpha Porter, secretary-treasurer; B. Ponzetta, vice president, production. 6. Buda diesels power 13 Allis-Chalmers TS-300 scrapers and Detroit GM diesels drive seven Allis-Chalmers HD-20 tractors. 7. Allis-Chalmers equipment helped move 15 million cu. yds. of earth for Doelger. 8. Home builder finds plenty for his four dieselized cranes to do.

Merle D. Geving, author of this article, is Superintendent of Utilities, La Sueur, Minn.



Newest engine in the plant is this 1910 hp Worthington dual fuel unit with an Elliott turbocharger and a Woodward governor. A Honan-Crane lube oil filter is shown at left.

LE SUEUR, MINNESOTA

By M. D. GEVING*

A modernization program for the Le Sueur, Minn., municipal electric utility that serves the city's 2700 citizens began in 1951. Like many other such operations, both the need for additional power and the generating costs had rapidly increased. Moreover, typical of other electric generating utilities, this system had experienced a rapid load growth each year since 1944 when the backlog of power consumption created by the retarding effect of World War II began to be absorbed.

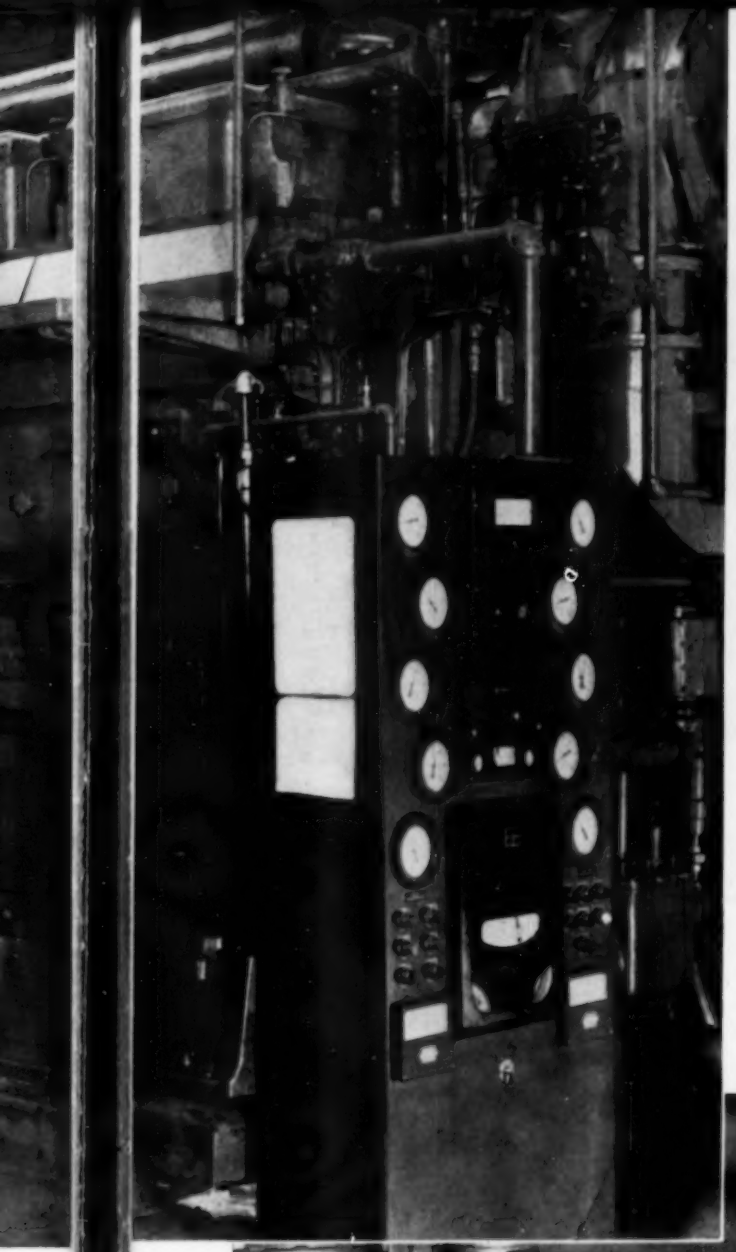
Le Sueur is located 55 miles southwest of the Twin Cities in the heart of a fertile agricultural trade area. In addition to serving this area, the power plant must supply electrical energy to the main canning factory of the Green Giant Co. Providing power for a seasonal industry presents definite problems. More installed capacity is required to satisfy the peaks experienced when the "pack" is on than is normally needed.

To meet these requirements and keep generation costs within reasonable limits were the problems confronting the utility superintendent and City Council in 1951. The latest addition to the installed generating capacity had been made in 1947, bringing the total plant capacity to 2443 kw with a firm capacity of 1400 kw. However, this firm capacity was none too reliable since some had to be provided by 20-year-old engines. Although natural gas was available, the entire generating plant was equipped with oil-fueled diesels.

To increase generating capacity quickly, we converted an existing unit of 700 kw capacity to operate as a dual-fuel unit. Although present-day dual-fuel engine efficiencies could not be attained, nevertheless, fuel savings made the investment sound in a single year's operation. This was Le Sueur's first step in its planned modernization.

The matter of additional jacket-water cooling equipment and a new switchboard had to be considered before additional generating equipment could be procured. The cooling equipment, in particular, was suffering because of limited cooling surface and the complications that arise with the gradual conversion from steam-engine generating units to a full diesel operation. A new, modern, metal-clad, G.E. switchboard was purchased and

Mr. Geving is Superintendent of the Le Sueur Municipal Utilities, Le Sueur, Minnesota.



relocated in a wing that had been added in 1947. At the same time, we revamped nearly all of the old station piping, using plant personnel. We next purchased a Marley dry-type cooling tower and arranged for an elevated water header to serve all four existing, and the anticipated fifth, engines.

By increasing pipe sizes and using a more streamlined piping arrangement, we reduced the station power requirements for circulating water. Three existing pumps were moved from the basement and placed in a pump bay on the main operating floor for better accessibility and ease of maintenance. The switchboard addition, rearrangement of feeders through a tunnel under a street adjoining the plant, and the installation of the cooling equipment and piping had all been completed by the time the new engine arrived.

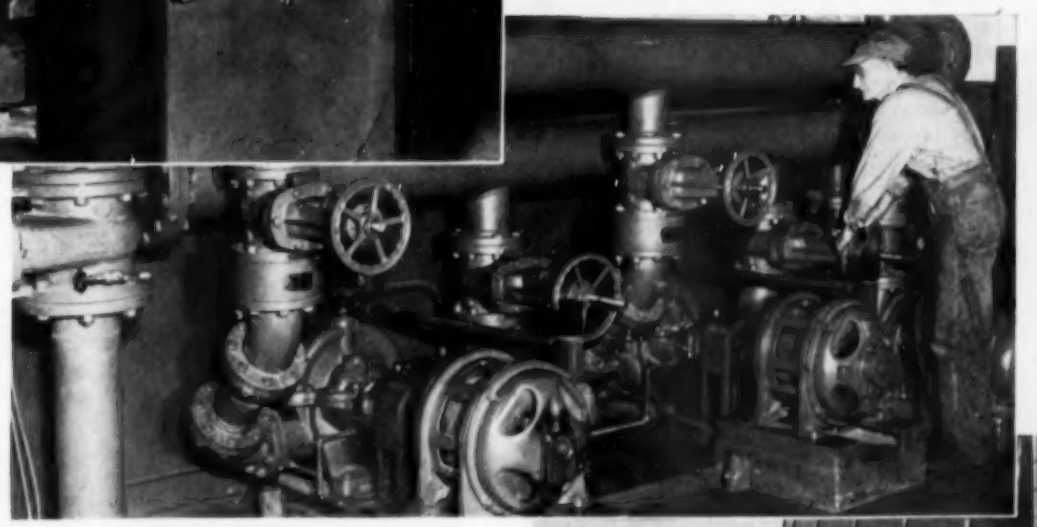
The engine selected was a Worthington Model SEHGO-8 four-cycle, dual-fuel type. It has eight cylinders providing a 16-in. bore and 20-in. stroke, and is supercharged by exhaust gas. At 360 rpm, the engine has a rating of 1910 hp and drives a 1350 kw, 0.8 power-factor generator, supplied by Electric Machinery Mfg. Co. The engine is equipped with the usual dual-fuel features: individual and adjustable gas metering valves under governor control; dual plunger fuel-injection pumps to provide for both pilot-oil service and full-oil operation; automatic switching equipment for change-over from gas to oil or oil to gas; thermal air control for maintaining a constant air-gas ratio at varying loads; and a water-cooled aftercooler.

The exhaust and air-intake piping for the engine is most simple. Both lines are carried overhead and project through the building wall above the switchboard. The air intake is particularly arranged for engine operation in the cold climate provided by the Minnesota weatherman. The air intake filter is mounted within the building, but is designed so that air can be drawn from the outside and, by opening a sliding door on the filter housing, the cold air can be blended with the warm air of the plant. Regardless of where the air originates, it must pass through the air filter element before reaching the silencer on the turbocharger inlet. This arrangement has a definite advantage in sub-zero weather, easing the starting of the engine, and providing for better combustion particularly on light loads. A door is provided in the bottom of the filter to permit lowering of the filtering element.

At present, the air aftercooler is connected to the municipal water service. Although the periods during which it is necessary to supply the aftercooler with cooling water are relatively short, inasmuch as the temperature at the air-intake manifold need only be kept below 125° F., the aftercooler will be reconnected to the old wet-type cooling tower. With this arrangement, sufficient water of approximately 90° will be available without the present loss of city water.

Natural gas of approximately 900 btu per cu. ft. is supplied to the regulating and metering station. The two gas-burning engines each meter the gas used so that we can separate fuel costs. The gas from the metering station passes through a scrubber, to regulators, and finally to the individual engine-fuel systems. Gas pressure is carried at 25 psi to the regulating valves on each engine and, from that point, reduced to the required pressure of each individual engine-fuel system.

The results of this work are now beginning to bear

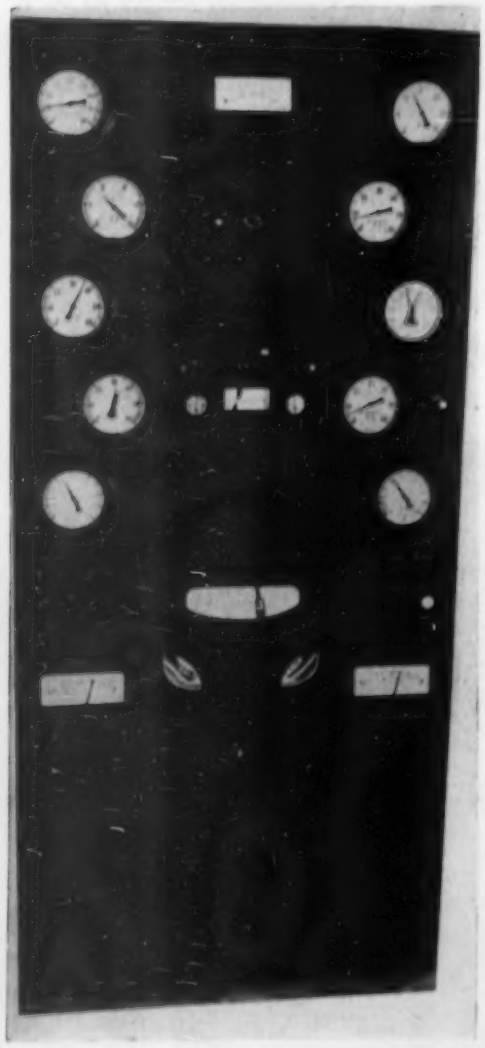


Ernest Krause, plant operator for 39 years, is setting Hager check valves on the DeLaval pumps driven by Westinghouse motors.

At the rear of the La Sueur plant are this Marley DriCooler, Maxim silencer, and storage tanks.

Located 55 miles southwest of the Twin Cities, the La Sueur, Minn., utility serves 2700 families. A modernization program begun in 1951 increased total capacity to 2443 kw.

The control panel is equipped with Alnor pyrometer, Bristol air controller, and gauges by Jas. P. Marsh and Liquidometer.



fruit in form of savings in generating costs. The new engine went into operation in 1953. During the year of 1954 this engine ran 5329 hours and generated 4,624,800 kwh., or 74.63% of the plant's 6,196,500 kwh for the year. With a load factor of only 64.42%, the fuel cost was $0.0039 per kwh. The low pilot-oil consumption, of 5.39% is another definite factor enabling this showing of low fuel costs. The average cost of natural gas, for the year, was 27.41 cents per 1000 cu. ft.

As mentioned earlier, the cooling system for the engines was entirely revamped in preparation for the installation of the new Worthington dual-fuel engine. After the new dry cooler was put in operation, and with the new piping system completed, definite reductions in station power consumption were noticed. A check into the records reveals the following savings:

Period of Operation	Kw/hrs
April to July 1952	136,775
April to July 1953	94,675
Savings	42,100

Power costs us 1.32 cents per kw/hr to produce. Thus the 42,100-kw/hr saving, projected over a full year at this rate, gives us a comfortable dividend of $1667.00.

Since the beginning of plant records in 1936, there has been a gradual increase in the cost of fuel. This increase reflected in the fuel cost per kwh, thus showing a low of $0.0050 in 1936 and a high of $0.0094 in 1949. As a result of renovations mentioned above, the past year, (1954), shows a new low for the plant in fuel cost per kwh of $0.0047.

Le Sueur's municipally operated power plant can be justly proud of its record. With sufficient generating capacity to withstand peak loads of 1800 kw now being experienced, together with the 1350 kw Worthington dual-fuel unit rolling up its thrifty operating record, we look confidently for a most favorable future. The utility operates under the management of the author who reports to the City Council. Records of the plant's operation which are used here are kept by E. B. Mueller.

Record of Performance

Year	Fuel Cost	KWH Generated	Fuel Cost Per KWH
1949	$39,641.85	4,195,875	$0.0094
1950	39,605.55	4,637,825	.0085
1951	40,412.20	4,933,975	.0082
1952	39,009.83	5,253,150	.0074
1953	39,553.66	5,512,220	.0071
1954 a	28,915.28	6,196,750	.0047

(a) 95% of total kwh, generated with two engines using gas.

List of Equipment

New engine—Worthington Model SEHGO 8-cylinder, 1910 hp at 360 rpm.
Alternator—Electric Machinery 1875 kva, 1500 kw, 60-cycle 2400-4160 volts. (Engine rated at 1350 kw).
Turbocharger—Elliott.
Governor—Woodward Type UG 32.
Gas meters—Pittsburgh.
Gas regulators—Fisher.
Gas cleaner—Blaw-Knox.
Fuel oil filters—Briggs.
Lube oil filter—Honan-Crane.
Lube oil cooler—Sims.
Aftercooler—Young Radiator.
B and A pump—Worthington.
Cooling tower—Marley DriCooler.
Water softener—Crane.
Air compressor—Worthington.
Exhaust snubber—Maxim.
Pyrometer—Alnor.
Fuel oil meter—Bowser.
Lube oil—Texaco Ursa P 40.
Switchboard—General Electric.

TUG "QUAKER" REPOWERED

After 52 years of Delaware River service, the *Quaker* had her steam plant removed and was repowered with a 615-hp Nordberg Supairthermal diesel. Here she is shown making nine knots.

Veteran Curtis Bay Towing Vessel Gains 200-Hp and More Speed and Work Capacity at 63 per cent Lower Fuel Costs When Converted from Steam to Diesel

By DOUGLAS SHEARING

RESERVE power for a tugboat is like money in the bank—you don't spend it unless you absolutely need it, and when you need it, you generally need it fast. In berthing a large passenger liner, a tug may complete 99% of the operation without once putting a full load on her main propulsion engine. Then, just as the big ship's first line gets over, a sudden gust of wind may catch her and push her toward the pier. It is at times like this, in a matter of seconds, that a tugboat needs that extra "money in the bank." If her main propulsion engine has the needed reserve capacity, the owner's investment is protected and the tug goes on to her next assignment. If it does not, then the owner has to answer to his client and to himself.

It was to transform a veteran tug which no longer "had it" into a more powerful, modern tug that Curtis Bay Towing, Inc., of Norfolk, Baltimore and Philadelphia, undertook the reconstruction of its 52-year-old harbor tug *Quaker*. The *Quaker's* old 400 ihp, non-condensing steam engine could no longer be depended upon to handle emergencies in which quick, decisive power was needed. With her new 615-hp Nordberg Supairthermal diesel engine, the vessel can handle such emergencies with ease and can safely operate at overload conditions when necessary. With an increase of more than 200 hp and with a top speed of 9 knots instead of 6½ knots, she can complete more jobs per day with less crew overtime per job. In an average month, her hourly fuel costs will be cut 63%, from $4.04 per hour to $1.47 per hour. The repowered *Quaker* is a safer, more profitable vessel to operate, a veteran tug which after more than a half-century's service is more efficient and more economical than the day she first slid down the ways.

The *Quaker* was originally christened the *Newcastle* in 1902 at Camden, N. J. Despite extensive reconstruction, her measurements remain the same, 82 ft. in overall length, 20.5 ft. in breadth (molded), and 10.5 ft. in depth (molded). She was built with a steel hull, wood pilot house and after house and her single-cylinder, reciprocating steam engine operated on saturated steam at 110 psi.

In those days, when sailing ships were still to be seen, the *Quaker* would put out from Philadelphia with her crew of seven and wait at the mouth of the Delaware River for the first ship to come in. Whether or not the spunky tug would work that day depended upon how well she could outscramble other tugboats in the area. Today, after two World Wars and half a century have changed the face of our modern world, this same tug is still "scrambling" in the Philadelphia-Delaware River vicinity.

Actually, she is scarcely the same tug. At a cost of $200,000, she was taken into drydock at Curtis Bay's Norfolk yard, stripped down to her bare hull, and rebuilt as a new ship. In addition to her new main propulsion engine, she now has a new steel pilot house and after house and features the most modern equipment available, above and below.

When the *Quaker* rejoined six other tugs at Curtis Bay's Philadelphia terminal on September 8, 1954, she became the 26th dieselized vessel in the company's 38-vessel fleet. She is a one-crew tug, meaning that her crew remains on board for as long as the dispatcher has immediate jobs for them to do. She regularly handles every type of harbor assignment, from barge towing to salvage work, a degree of versatility which was impossible before her higher-powered Nordberg engine was installed.

To illustrate the impact which dieselization has had on the *Quaker's* present and past operating performance, Curtis Bay has released the tug's log reports for the corresponding months of November, 1951, and November, 1954. In November, 1951, shortly before reconstruction work was begun, the steam-powered *Quaker* logged a total of 271 hours of operation, burning 202,832 lbs. of coal valued at $1096. This represents an average coal consumption of 748 lbs. per hour and an average hourly fuel cost of $4.04. In contrast to this, in November, 1954, the reconstructed *Quaker* logged a total of 290 hours of operation, her Nordberg engines consuming 4600 gals. of oil valued at $427. This represents an average fuel consumption of 15.86 gals. per hour and an average hourly fuel cost of only $1.47.

Thus, with her 38% greater horsepower and speed, the *Quaker* is completing a greater number and a wider variety of jobs per month—at a fuel cost which is almost a third of what it formerly was. This is a conservative estimate, as is demonstrated by broadening the basis of comparison to include the *Quaker's* first three months of diesel operation. Through September, October and November, 1954, the *Quaker* operated for a total of 740 hours, consuming 9727 gals. of diesel oil at the rate of 13.14 gals. per hour. This represents a total fuel cost for the period of $908, an average hourly fuel cost of only $1.22. Compared to November, 1951, this indicates a fuel-cost reduction of 69.8%.

Partly responsible for this sharp reduction in fuel costs is the fact that diesel tugs can get underway at a moment's notice, without the long get-ready and shut-down operations peculiar to steam-powered vessels. Operating hours and fuel hours are virtually identical on diesel tugs, whereas on steam-powered vessels there is a distinct difference. In November, 1951, for example, the steam-powered *Quaker* logged a total of 586 fuel hours, of which only 271 hours were spent in actual operation. This means that in one month the tug's 110-lb. boiler was consuming coal for a total of 315 hours while the tug was awaiting assignment—not one minute of which can be accepted as revenue-producing time.

Since she was repowered with a 615-hp Nordberg diesel, however, the *Quaker's* fuel hours and operating hours appear as identical entries on her monthly log reports. This means that her main

Looking forward in tug's engine room. The 6-cylinder Nordberg is equipped with a Brown-Boveri turbocharger, Falk reversing-reduction gear, Air-Flex clutch, and Briggs fuel and lube oil filters. Kewanee-Ross made the lube oil cooler and heat exchanger. In the system is an Amot thermostatic by-pass valve.

propulsion engine remains shut down until time for an assignment, making possible not only a more economical use of fuel but a more economical use of labor. In the past, a partial crew had to be kept on board whenever the tug's boiler was fired. Other labor savings introduced through dieselization result from the fact that the crew has been reduced from seven to six. In addition, since her greater speed and maneuverability enable her to complete each job in less time, crew overtime hours per job have been cut.

These savings, plus the lower maintenance costs to be expected from the new equipment, plus the increased revenue the more active and versatile tug is currently bringing in, make the *Quaker* a truly unique vessel, one which is more profitable to operate today than she was 50 years ago. She is being depreciated by the sum-of-the-digits method, permitting the cost of her reconstruction to be written off during her earliest and best revenue years, but Curtis Bay expects its "rejuvenated" tug to pay for herself in higher profits and lower operating costs long before this depreciation period runs its course.

The new main propulsion engine is a six-cylinder, four-cycle, 9-in.x11½-in., equipped with intercooler and exhaust gas-driven turbocharger, and rated

615 hp at 720 rpm. It drives a 4-blade, right-handed, manganese-bronze propeller of 83 in. diameter and 63 in. pitch through an Air-Flex clutch and 3.428:1 reverse-reduction gear. Normally this same engine would be rated 640 hp at the above engine speed, but because the reduction gear installed is rated at 600 hp, the engine has been derated to 615 hp.

Nordberg's Supairthermal design in the main propulsion unit combines a turbocharger, an air-to-water intercooler, and automatically-controlled air inlet valves to supply a maximum amount of cool engine air to each cylinder. This great weight of cool air not only provides more efficient cooling within the cylinders but permits greater amounts of fuel to be used, resulting in one-third higher horsepower output without any increase in maximum temperatures or pressures. The design, plus the fact that most auxiliaries are engine-driven and are mounted directly on the frame, help create a compact, heavy-duty marine unit which on the *Quaker* occupies only about half the engine-room space formerly needed for the steam equipment.

Fuel oil for the *Quaker's* engine is stored in two bunkers forward and one bunker aft, having a combined capacity of 12,210 gals. It is sent to a 60-gal. overhead day tank through a single-cartridge, cellulose-type filter, by a motor-driven reciprocating pump. From the day tank, it flows by gravity to the engine, passing first through a duplex, bag-type filter before reaching the injection pumps. Lube oil is drawn from a 150 gal. sump tank and sent to the engine by one of two engine-driven lube pumps.

The other lube pump circulates lube under pressure through the engine, through a full-flow, multi-cartridge filter, through a shell-and-tube-type cooler, and back to the sump. In starting the engine, a motor-driven priming pump is used.

Fresh cooling water is circulated through the engine in a closed system by another engine-driven pump, passing through a thermostatically-controlled by-pass valve before reaching a shell-and-tube type exchanger. Raw river water is circulated as a coolant through the air-to-water intercooler, through the lube oil cooler and through the jacket-water heat exchanger by a fourth engine-driven pump. It is drawn from the vessel's sea chest and is discharged overboard at the end of its circuit.

Engine air is drawn from the engine room through an intake filter, is compressed to approximately 15 psi by an exhaust-gas-driven turbine (raising its temperature from about 90°f to 250°f), is cooled in the air-to-water intercooler (to approximately 100°f), and enters each cylinder through an automatically-controlled inlet valve. In the cylinder, the air is expanded from 15 lbs. to 6 lbs:, a unique design feature which drops the air temperature to approximately 50°f at the start of the compression stroke, thus providing maximum cooling.

Supplying the ship's service power are two direct-current diesel-generator sets, each rated 20 kw, 120 volts, 167 amps., and driven by a General Motors diesel. A separate panel on the vessel's two-panel switchboard, equipped with oil circuit breakers, serves each generator. To further distinguish the rebuilt *Quaker*, her old hand-steering gear, powered with a small reciprocating steam engine, has been replaced with a specially designed, ram-type, follow-up steering system which is the only one of its kind to be installed anywhere and which operates on a 100 psi compressed air supply. This unique steering gear is controlled from a lever-type console in the pilothouse, with a duplicate console located on the after deck. Basically, the system consists of two steering cylinders equipped with relay and follow-up type valves and linked port and starboard to the rudder post. While the tug is maintaining a steady course, the air pressure on each side of the pistons in these cylinders is perfectly balanced. When maneuvering, any calibrated movement of the steering lever in the pilothouse alters this balance and causes a corresponding change of rudder angle. Once the rudder angle has been adjusted, the disturbed balance in the steering cylinders is restored and the tug automatically holds her new course.

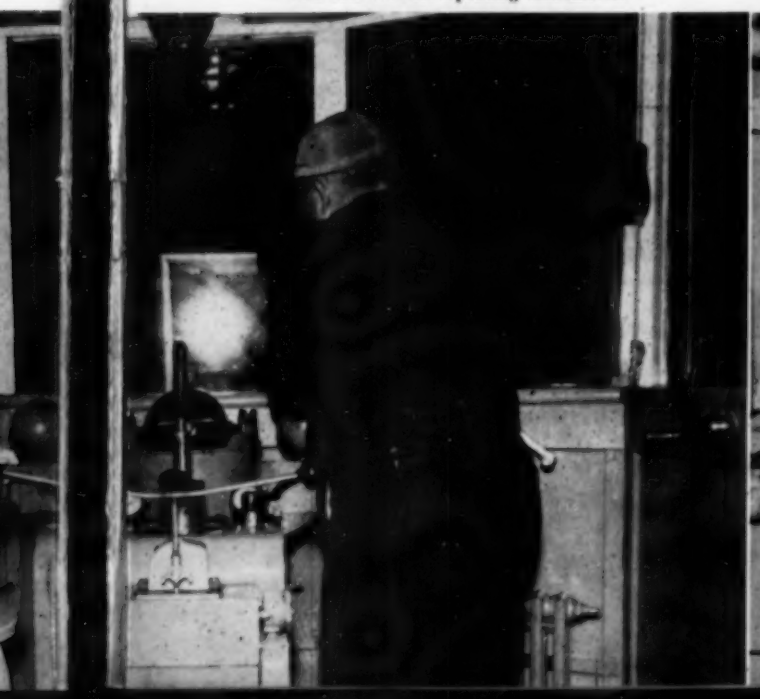
There are sleeping quarters on board for nine, although the *Quaker* now carries a crew of only six, including a captain, mate, chief engineer, cook, oiler and seaman. With a schedule which often sees the same crew kept on board for as long as five consecutive days, these quarters are unusually well used for a harbor tug. In brief, the *M/V Quaker* is one of the most modern tugboats currently operating on the Delaware River, despite her half-century of service. Rebuilt from a bare hull with new equipment installed from stem to stern, she is more powerful, safer, more maneuverable and more profitable to operate than she was 52 years ago when she first slid down the ways. Her 615-hp Nordberg main propulsion engine has increased her speed by more than a third, while cutting her fuel costs by more than two-thirds. Veterans who remember her when she was new, escorting steam and sailing vessels from the mouth of the Delaware River to Philadelphia, are a little envious of her "rebirth" and a little disappointed that medical science cannot do the same thing with human "hulls." But they are proud of the rejuvenated *Quaker* and fully expect her to continue in service for another 50 years.

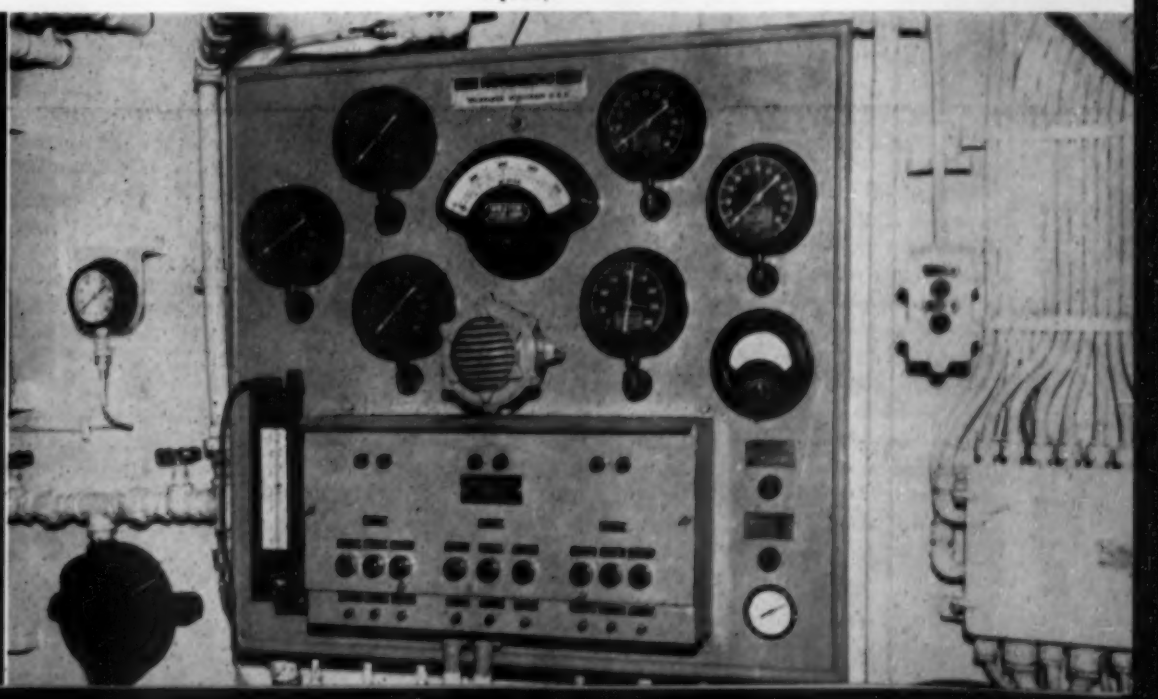
List of Equipment

Main engine Nordberg Supairthermal diesel, four-cycle, six-cylinder, 9-in.x11½-in.
Turbocharger—Brown-Boveri.
Reversing-reduction gear—Falk.
Pneumatic steering gear and main engine remote controls—Westinghouse Air Brake.
Duplex fuel oil filters—Nugent.
Full-flow fuel oil filters—Briggs.
Fuel injection pumps—Bendix.
Full-flow lube oil filter—Briggs.
Lube oil cooler—Kewanee-Ross.
Thermostatic by-pass valve—Amot.
Jacket water heat exchanger—Kewanee-Ross.
Gauge board—Nordberg.
Vacuum gauge—Meriam.
Exhaust pyrometer—Alnor.
Tachometer—Weston.
Ship's service diesel-generators—Detroit GMC.
Fire pump—Gardner-Denver.

Capt. Eba Lynch is pictured in the new all-steel pilothouse. Shown are the Westinghouse Air Brake steering console and Weston repeating tachometer.

The Nordberg gauge board is visible from most engine room locations. Shown is a Weston repeating tachometer, Alnor pyrometer, and Meriam vacuum gauge. Modernizing the vessel allowed a reduction in crew and lower operating costs, and provided greater work capacity.





The GE-Alco diesel-electric locomotive in front of a string of cars at Skagway dock where rail ends and Inside Passage steamer begins. Diesel No. 90 here meets Canadian Pacific SS *Princess Norah*.

HISTORIC WHITE PASS & YUKON ROUTE MODERNIZES WITH DIESELS

By CHAS. F. A. MANN

WHEN the first prospectors filtered into Yukon territory, they came via steamer up the inside passage to Alaska. From Skagway, they went by foot or pack train over the passes and into the Yukon River basin. The question of supplies for the country was a pressing one. To answer it, 55 years ago, the White Pass & Yukon route was rushed to completion. It has been hauling freight and passengers to the North ever since.

Through all the violent surges of prosperity and glamor, the little narrow gauge White Pass & Yukon route kept and keeps plugging along. It is "route" because it is actually several corporations. The line is comprised of the Pacific & Arctic Railway & Navigation Company, operating in U. S. territory and chartered in West Virginia; the British Columbia Yukon Railway Company, operating where the line crosses a finger of remote British Columbia; the British Yukon Railway Company for operating in Yukon Federal territory, and the British Yukon Navigation Company Ltd., originally created to operate the vast fleet of river steamers but now the corporate entity which renders bus and truck service along the Alaska highway! A BYN bus will take you from Whitehorse to Dawson, except during freeze or thaw periods, and from Whitehorse to Dawson Creek, B.C. They are also trying diesels in buses and trucks.

Ever alive to the thin thread of wavering traffic to the sparsely populated far north, this railroad system is the most responsive on the continent. Hemmed in by great distances, thin population, climatic and geographical barriers, the company in the fall of 1954 emerged with two new diesel-electric locomotives as a start toward profitable operations. The two locomotives set the pace for the eventual replacement of the entire fleet of 36-inch gauge steamers.

The motive power department of the company, under Mr. Hoyt and Mr. Abrams, at Skagway, and President Rogers, at Seattle and Vancouver, had been thinking about diesel for some time. It wasn't until General Electric undertook to build the special kind of locomotive required, that officials were able to proceed with their plans. The first two White Pass locomotives have been delivered, tested, run singly and in pairs, and emerged from their first White Pass Summit blizzard in late November.

Basically, by using a neat 3-axle, 3-motor truck, the GE design gives a very wide range traction motor output, with all 6 axles being motored. This means high tractive effort at even low adhesion factor due to bad rail, ice, snow under the flanges, etc. With only about 135 hp per axle maximum, these little locomotives will drag down to 5 mph with load and keep it up all day. The cabs are full standard gauge railroad width, over 10 feet. This permits ample room for the 800 hp special duty Alco diesel and plenty of space to recirculate radiator and traction motor cooling air in a blizzard at 40-to-50° below zero. There is ample insulation on all piping, and, if necessary, almost tight closure for brief spells during heavy storms.

To understand what winterizing means on this

operation, remember that temperatures range on the White Pass route from 90°f in the summer to 60° below zero at Whitehorse in January. The Skagway winds become gales over Lake Bennett and in the winter they can fill a locomotive cab full of snow in a very short time.

Dimensions of the GE diesel-electrics are:

Weight, loaded	167,400 lbs.
Per driving axle	27,900 lbs.
Track gauge	36 in.
Length inside knuckles	45-ft., 7¾-in.
Length between center plates	21-ft., 2½-in.
Overall height	14-ft., 1½-in.
Wheelbase, truck	9-ft., 9⅜-in.
Clearance, gear case to rail	4¼-in.
Track curve, minimum	26 degrees
Continuous rated tractive effort	24,000 lbs.
Rated tractive effort at 30% adhesion	50,220 lbs.
Max. speed, motoring	40 mph.
Max. speed, braking	32 mph.

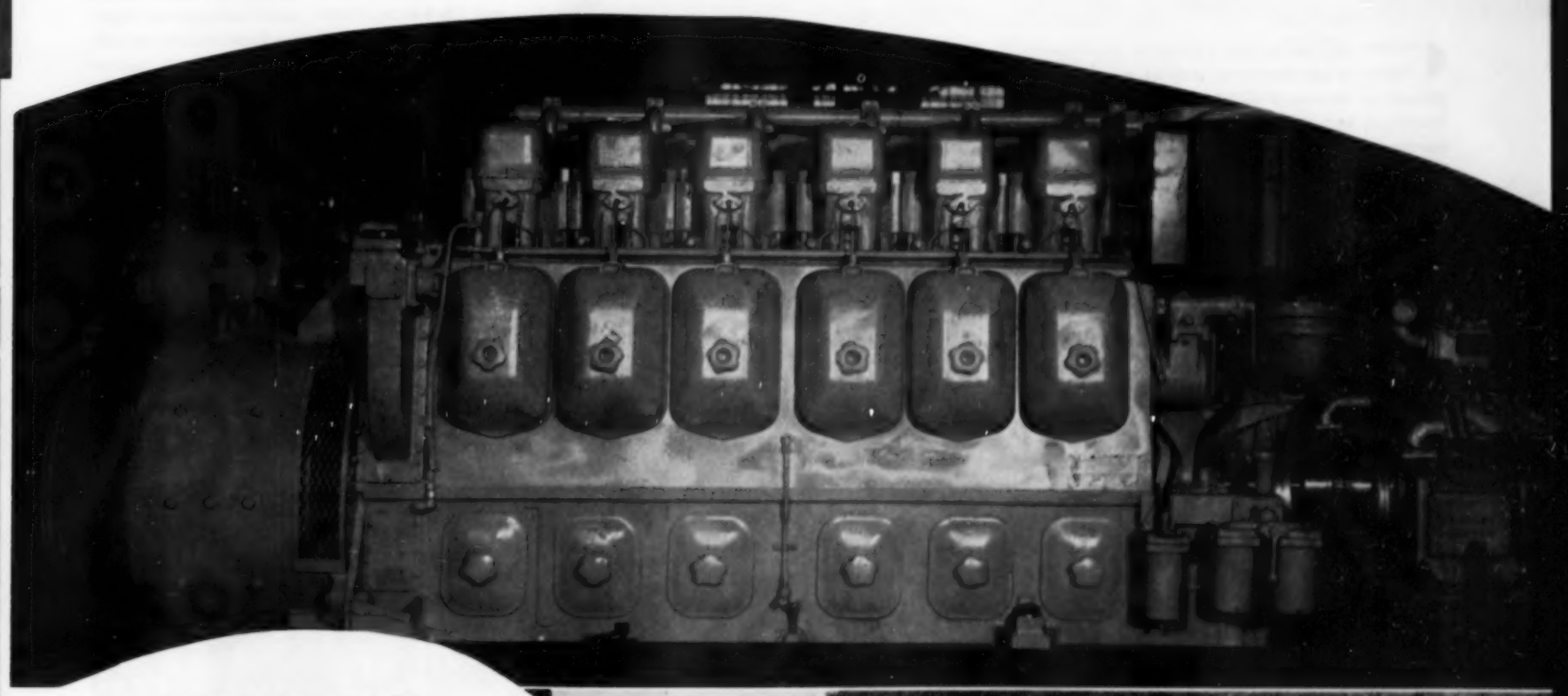
The main diesel engine is an American Locomotive series 251, 6-cyl., 4-cycle, 9-in. by 10½-in. single acting diesel with turbocharging. It features two intake and two exhaust valves per cylinder, and, with cooled pistons, delivers full power at 1000 rpm. A Gardner-Denver 2-cyl. air compressor is clutch driven from one end. A panel-type radiator is mounted high on each side near the rear of the locomotive and each has air operated louvers automatically controlled for winter and summer.

All electric equipment is by General Electric, including six type GHM-842 motors and type GT-584 generator. Air brakes are Westinghouse. All axle bearings are 5x9 Timken. The fuel oil heater is by Vapor Car Heating. The radiator is Yates American. The fuel oil heat exchanger is by Vapor Car Heating. The Viking fuel transfer pumps and Exide 32 cell 426 AH storage battery are also part of the equipment.

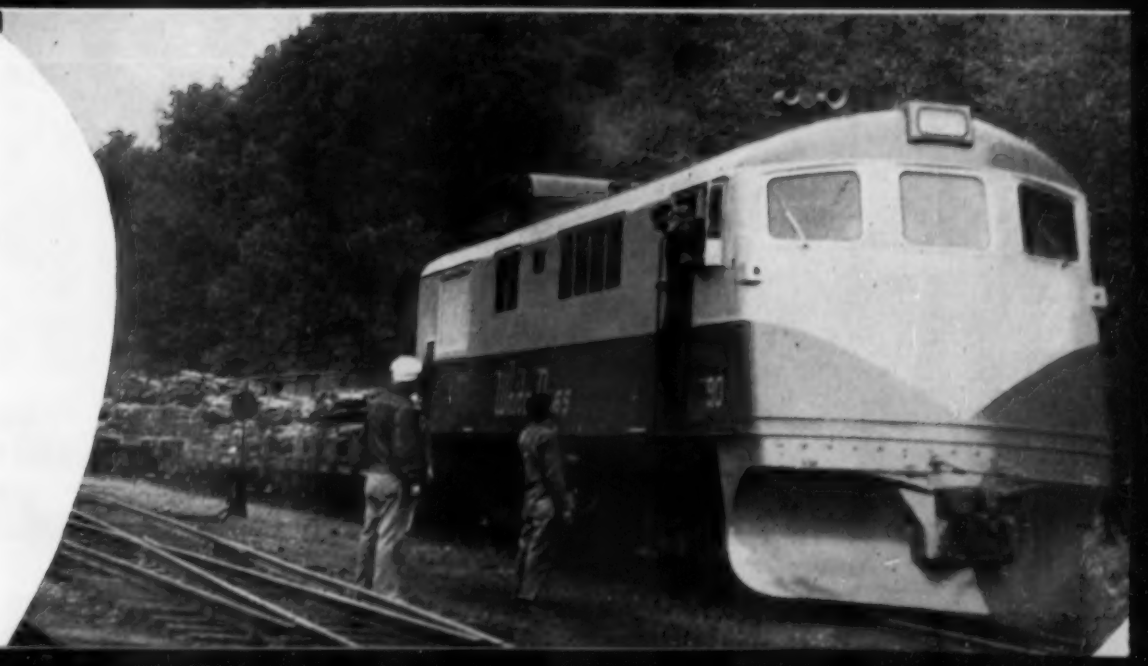
Stores capacities are 540 gallons of fuel, 100 gallons of lube oil, 85 gallons of water, 12 cu. ft. of sand and 48,000 cu. in. of braking air reservoir capacity. All Canadian and U. S. regulations are met by all equipment. All servicing and maintenance is done at the Skagway shops.

These 80-ton units can be operated in pairs and are expected to pull 260 tons as against 160 tons by existing steamers. The first 20 miles out of Skagway has an average grade of 2.6% with a 3.9% maximum in spots and many 15 and 20 degree curves. Much of the year, the rail is wet and slippery on the west side and for five months snowy on the rest. Through its entire 111 miles, the route offers both spectacular scenery and a constant challenge to the equipment, crews and operating personnel. Most of the tonnage is freight with heavy ore movement downhill to tidewater. In winter, at White Pass Summit, 30 to 60 feet of snow falls with 20 feet on the ground and much of it drifting. Pneumatically operated snow flangers and thick steel fenders permit operation through this country of slides and snows.

Extensive rebuilding to handle heavy World War II loads of military and construction supplies have left the railroad in excellent physical shape and now, with full highway-truck connections at Whitehorse, its future freight traffic load seems secure. And so, one of the world's most picturesque railroads now goes diesel.



The American Locomotive Series 251, 6-cyl., 4-cycle, 9-in. by 10½-in., single acting, turbocharged diesel which powers the new White Pass & Yukon railroad locomotives. It is an in-line, 800 hp engine. Note the Gardner-Denver (far right) air compressor which is clutch driven off one end. All electric equipment is General Electric and the air brake is Westinghouse.



No. 90 at the top of White Pass ready to go downhill with a load of ore concentrate, bound for Trail, B.C., smelters.

CALIFORNIA CORN

By HAL F. HIGGINS

Veteran Herringer ranch shop mechanic, Joe Leal, is shown at the side of the GM-powered alfalfa harvester he designed and built.

CORN is coming into California farm operations as an important crop at long last. Ingenuity in the use of diesel engines has played an important part in this development, as this writer observed at first hand. He saw corn harvested by two different dieselized machines on a ranch where diesels have been put to work in a large variety of ways. Guide on the trip was the inventer of one of the corn harvesters,—Wem Lely.

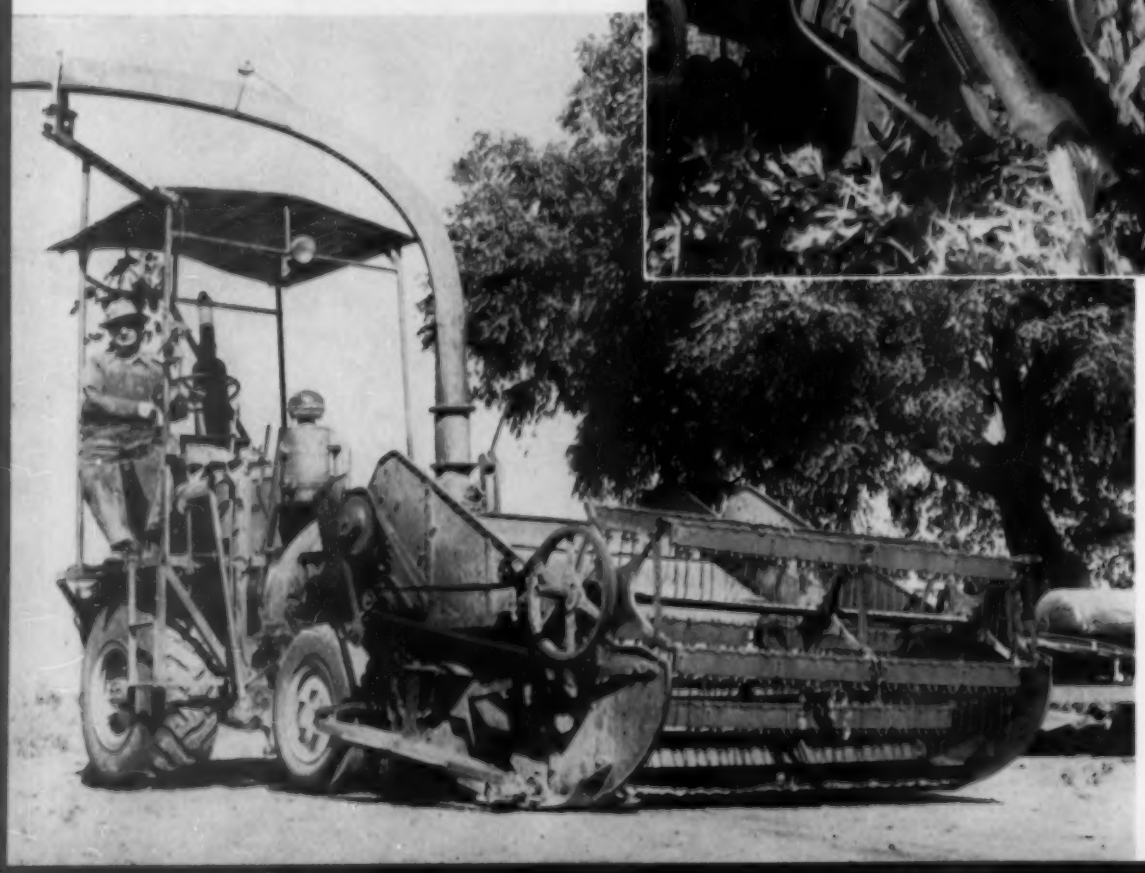
Corn may not come to California in as big and decisive a way as did cotton, but the past few seasons of trial and error by farmers in widely scattered sections of the state indicate corn is here in California to stay. Agreed on this point are leading farmers, University of California agricultural engineers, and the manufacturers of farm machinery and their dealers. They say corn fits into the local crop picture along with alfalfa, sugar beets, vegetables and grain as a cash crop.

Two primary factors contribute to making corn growing practical in California: (1) The state has a big and expanding population which consumes an increasingly large amount of the livestock that fattens on corn; (2) War-born "supports" now are forcing "controls" on crops, with acreage cut-backs that tend to step up grass farming—which requires less labor while providing cheap feed for large populations of cattle and sheep. And, as will be shown, a third factor is the widespread existence of farm machinery that can be converted to use for harvesting corn.

Your Old Reporter has given the California trend to corn a close look. He visited the corn school at Willows and has held personal interviews on the subject on key ranches in Kern, San Joaquin, and Yolo counties. As a corn belt native, he learned about corn in the first place in a land where corn is king instead of being just one of a couple hundred different commercial crops. The views of University of California scientists were confirmed by witnessing the Mettler operations in Kern county, and by a visit to the big Herringer family farm, described herein.

After having heard for some time about a new farming machine, invented and built by Wem Lely at Orland, your writer was ready to drop his office work for a day when Mr. Lely phoned. He wanted a companion on a trip in his private plane to the expansive fields of the Herringer family near Clarksburg. As the plane followed the course of the Sacramento River, one could see and identify various corn pickers at work in the rich bottom lands. Observed were Case, Deere, International and Minneapolis-Moline in various models. However, as far as farm diesel engines go, the writer

An International MD is the wheel tractor that carries the International corn picker seen here in a field of corn. Trailed behind the picker is an Ottawa sheller that shells the corn as it is picked and dropped into a hopper in the rear.



One of the two dieselized "alfalfa machines" at the ranch shop. One is powered by a GM and the other by an International UD14. Joseph Leal, who designed the machine, is rated one of the top ranch mechanics of the state by University of California agricultural engineers. The machine was built in the ranch shop.

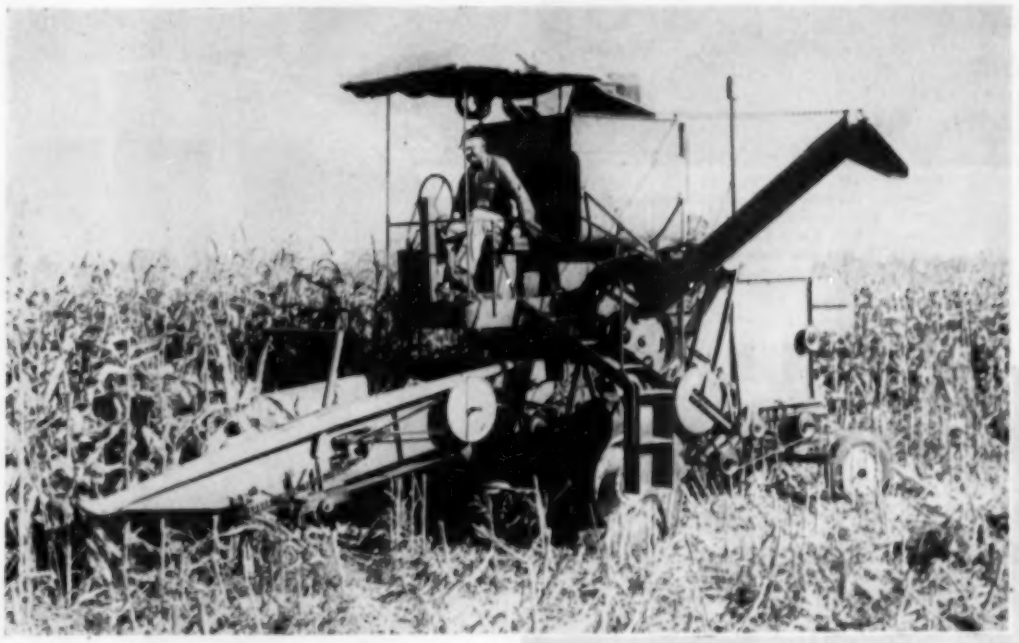
knows this area to be predominantly International. Various IH models have been seen on nearly every farm in the region.

In a little more than one hour, the plane landed on the Herringer place. Although there are 10 Herringer boys—brothers and cousins—they work about 5800 acres as one unit. Two brothers came to California in 1900 and reclaimed their land the hard way. Today, their decendants, the 10 Herringer boys, farm the 5800 acres with varied crops. It was their know-how and enterprise which put over the revolutionary Mar-Beet harvester during the war years and they have established an excellent reputation for good diesel shop work.

The shift to corn on the Herringer farm hinged on the success of the Lely attachment to the ordinary grain combine. It picks and shells the corn crop as it moves through the field. We saw two different types of picker-sheller harvesters at work. The Lely attachment was on a John Deere self-propelled combine. It was doing an excellent job on corn of close to 20% moisture. The other machine was an International picker hung on an IH combine, with an Ottawa sheller being trailed to catch and shell the corn as it dropped into it. The veteran IH dealer in Rio Vista was not overlooking the revolution that was going on in his area. International's Gordon-Hanson dealership is an old established firm which takes second place to no other organization in keeping its big red line in its dominant position in the territory. The company's No. 1 sales-service engineer was noted looking both picking outfits over.

Here is the special "Gopher" designed and built in the Herringer ranch shop. It is attached to a 3-foot standard, hung on the tool-bar at the rear of the International TD14 tractor. The "Gopher" digs a trench to drain the water off top soil to prevent water logging of crops.

As we were about to board Wem's plane for our return trip, the situation was well summarized by one of the Herringers, who said: "California farmers can begin raising corn without making a big investment in new machinery,—thanks to Lely's attachment which converts a small grain combine into a corn harvester. We sure are going to stay in corn. It fits into our crop rotation plan, our supply of labor and machinery, and our program for fertilizing the fields."



Wem Lely's attachment on a John Deere 55 small grain combine enables the machine to harvest corn as well as other grain crops.

An International TD14 pulling a Mar-Beet 2-row harvester on the Herringer 1100 acres of sugar beets. The Herringer shop is credited by Professor Bainer of the University of California as being largely responsible for making the Mar-Beet harvester work when the question of California's growing of sugar beets hinged on making it work.

Nancy Jane of the Campbell Barge Line, Inc., Pittsburgh was one of the first of the new RAM-Class towboats finished by Dravo.

Engine throttle and reverse-reduction gears are controlled by a single lever system. The Twin Disc gears allow engines to run continuously in same direction.

FIVE DRAVO RAM-CLASS TOWBOATS ARE COMPLETED

Twin Atlas Diesel Engines of 290 HP Drive Propellers Installed in Kort Nozzles; DeLaval Pump Provides Hydraulic Steering; Auxiliary Power Furnished by GM Generator Sets

By W. L. BODE

THE first series of five RAM-class towboats has been completed at the Dravo Neville Island shipyard and additional vessels of this class are under construction. Dravo engineers explain the RAM was developed to meet the growing demand for a versatile barge-pushing vessel which combines adequate power and maneuverability with low-cost operation and maintenance. The design is based on the need for vessels of varying sizes to perform specialized functions in numerous inland waterways operations.

The main uses of the 70-ft. craft include short and medium range towing of sand, gravel and coal, shuttling cargo barges between terminals in river harbors, and handling non-self-propelled vessels on marine construction jobs. When used for barge-shuttling duties, the RAM is comparable to a railroad switch engine. It relieves the bigger, costlier-to-operate towboats from the time-consuming chores of collecting and delivering individual barges around river terminals. The RAM design incorporates many features which heretofore have been found only on the larger boats. With a total rated engine output of 580 hp, turning two propellers installed in Kort Nozzles, the vessel has substantial pushing ability for the jobs it performs.

General dimensions of the RAM are: length, overall (molded) 70 ft., beam (molded) 20 ft., depth at side, midship (molded) 8 ft., draft (with bunkers loaded) 5 ft. 11 in. Hull and superstructure are of welded steel construction. Four main transverse and two longitudinal bulkheads subdivide the hull into water and oil-tight compartments. The hull forward, of modified scow form, is fitted with two welded steel towing knees. The knees extend from 3 ft. 2 in. below, to 6 ft. above the deck and are built integrally with the hull. A steel fender of bent plate and fitted at the deck line, protects the full length of the vessel and the full width of the stern.

Deck fixtures include one hand-operated capstan, two hand winches, one hand-operated boat crane, four 9-in. cast steel deck roller chocks, nine 36-in. cast steel kevels, and one double towing bitt. The RAM's pilothouse, four staterooms, bath, galley, and mess room all are accessible through internal passageways, an advantageous design feature for this size vessel. A unique feature is the absence of a smokestack. Exhaust from the diesel engines discharges through two small pipes installed flush with the aft wall of the pilothouse. This gives the pilot better visibility astern.

Propelling machinery, generator set, heating furnace, and water and hydraulic pumps are located in the hold amidships. The 2000-gal. fresh water tank and the 200-gal. lube oil tank are located aft of the main engine room. The fuel bunker is placed in the forward hold of the vessel. The oil tanks have a capacity for 12 to 14 days of continuous operation. A pair of Model 35X Atlas diesels provide the main power. The 6-cylinder, supercharged engines each are rated at 290 hp at 1200 rpm. They are equipped with Twin Disc reverse reduction gears of 2.93:1 ratio. These gears allow the main engines to run continuously in the same direction, thereby making it unnecessary to stop the engines when reversing the vessel's direction. Engine throttle and reverse gear are controlled from the pilothouse by a single lever system.

The engine cooling system is a skin type arrangement built into the inner bottom of the machinery compartment. The engine foundation and hull bottom for the center section of the vessel were constructed integrally in Dravo's shops. The built-in cooling system eliminates any protruding equipment on the hull. Two steering rudders and four backing rudders are operated by hydraulic, ram-type steering engines controlled from the pilothouse. The two hydraulic rams are clevis mounted.

A DeLaval IMO hydraulic pump furnishes hydraulic operating pressure for the steering gears. The pump is driven from the main engine stub shaft. A second DeLaval IMO pump serves as a standby. It is driven by an electric motor.

Steering ahead is effected by one steering rudder aft of each propeller. Two flanking rudders forward of each propeller control steering ahead or astern. Rudders are of all-welded, watertight construction made up of double steel plating. The two high-tensile-strength, four-blade propellers are cast manganese bronze. A Kort nozzle is fitted around each propeller and shaped into the hull.

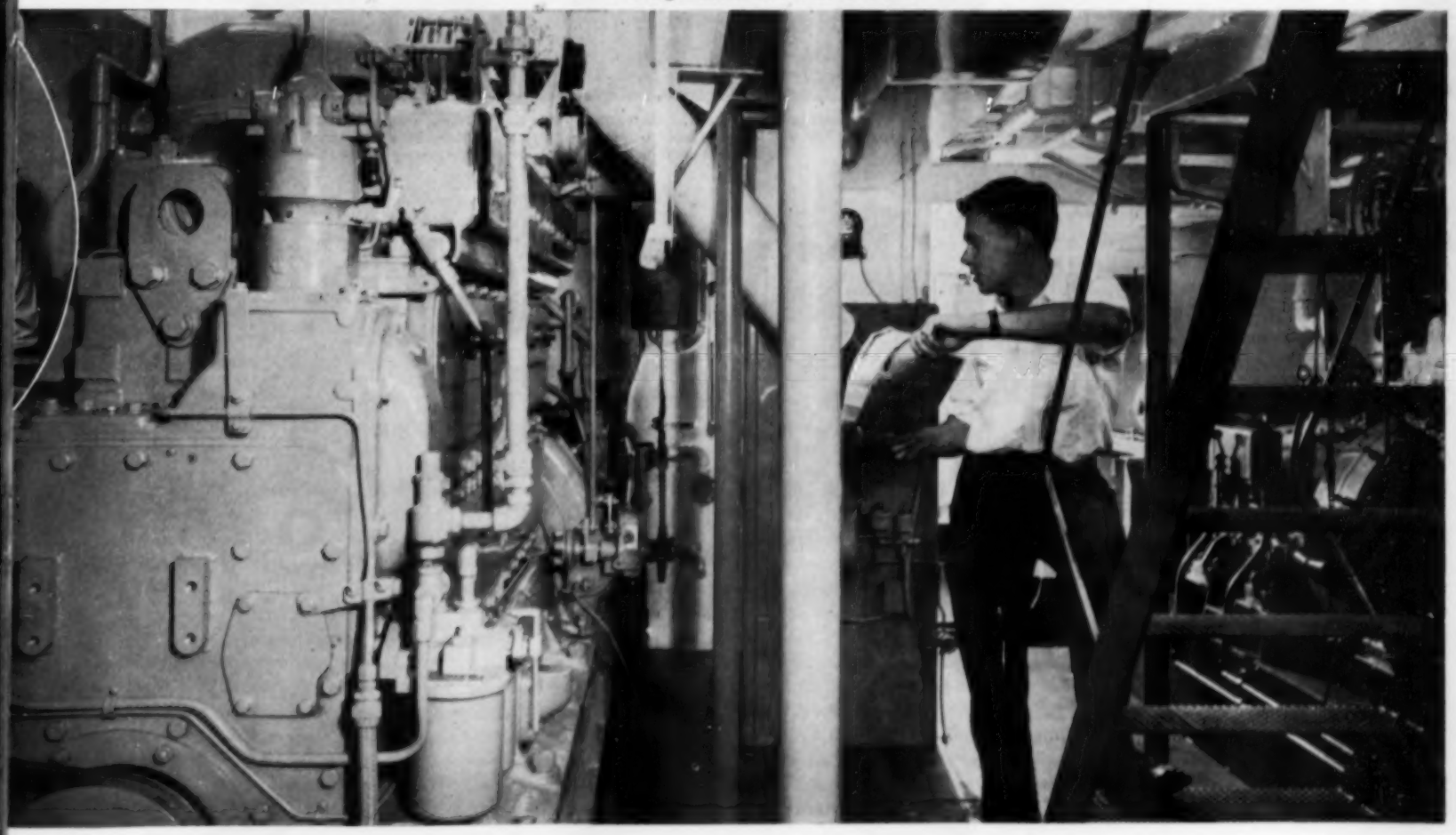
Electric power is furnished by a diesel-driven generator set of 20 kw, 120-v, dc, at 1200 rpm. A second generator, of 10 kw at 1200 rpm, is provided as a standby. It is connected through V-belts and pulleys to the front stub shaft of one of the main engines. Both generators are connected to the switchboard. The deadfront switchboard distributes the power to all electrical equipment.

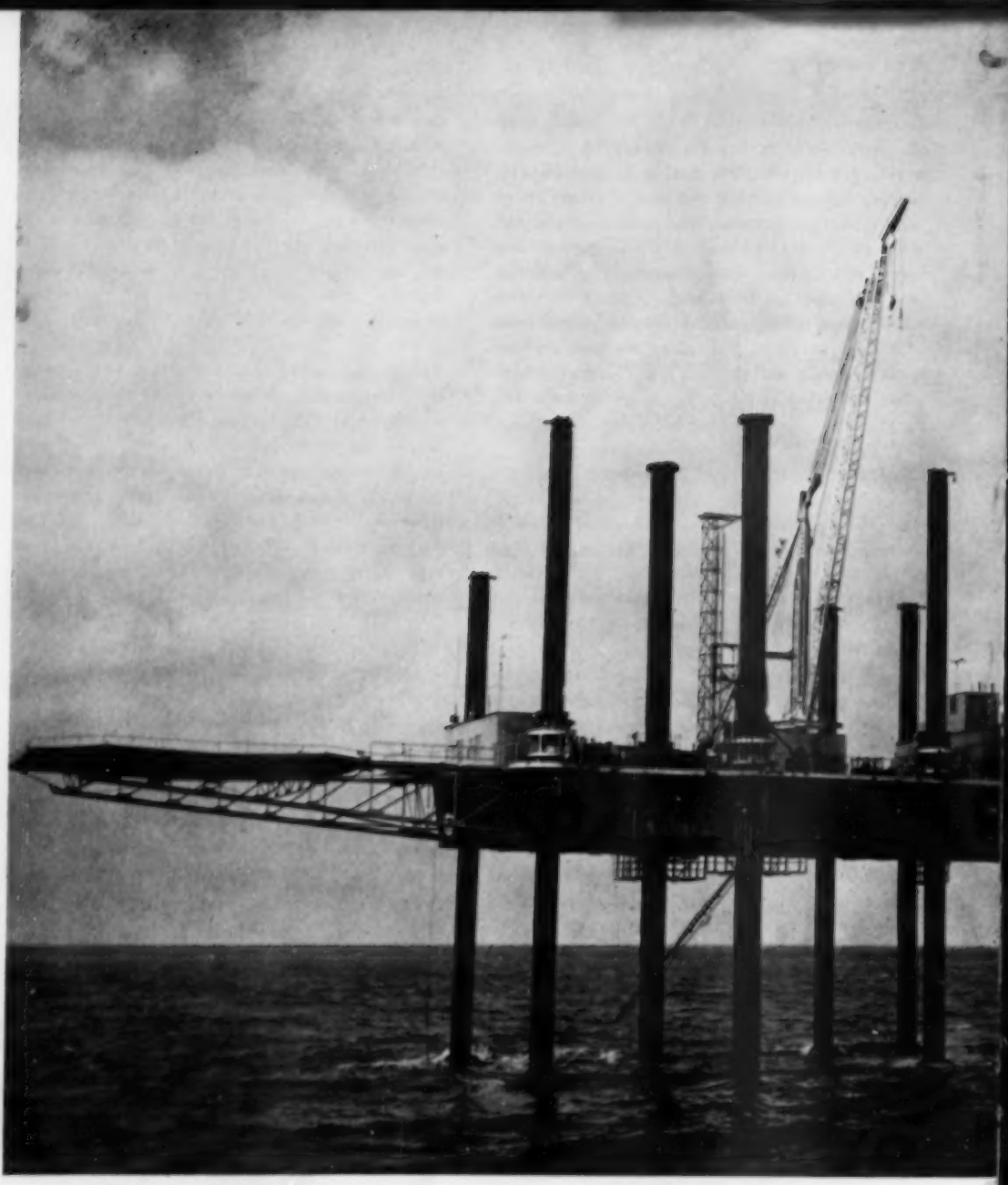
The RAM-class boat carries 2000 gallons of fresh water which is circulated by a turbine type water pump. A self priming, centrifugal pump unit serves the bilge system and provides water for deck washing. The four staterooms are equipped with four double bunks and eight steel lockers. The booth-type mess room is located forward, directly under the pilothouse. Assembly-line construction methods were used for this class of vessel, which is now a standard stock production model in the Dravo towboat line. Employment of this technique made it possible to include in the design many functional and operating features that would have proved too costly if the towboats were built individually.

List of Equipment

Main engines—Atlas Superior Model 35X.
Reverse and reduction gears—Twin Disc.
Electric starting system—Leece-Neville.
Hand lube oil sump pump—Blackmer.
Tachometers—Weston.
Steering gear pumps—DeLaval.
Main generator unit—GM 2-71 20 kw.
Standby generator—Safety Car Heating.

RAM-class vessels are powered by two Model 35-X Atlas diesels, each rated at 290 hp at 1200 rpm. Engine room arrangement, although compact, is designed for convenience in doing maintenance and service work.





Currently under lease to the Shell Oil Co., *Mr. Gus* is shown here on location off the Texas coast. The well-head casing is being lowered to ocean floor. Note heliport at extreme left. This self-contained drilling rig can operate in water up to 100 ft. deep.

"MR. GUS"

By JAMES W. CALVERT

THE embryonic science of prospecting for oil at sea has developed some strange, new tools. Probably the most fantastic one is the self-contained mobile drilling unit. It can be floated to its offshore location whereupon it ceases to be a water-borne vessel and becomes a man-made island of steel upon which men live and work.

Several of these giants have been completed in recent months,—since the oil industry was given the nod by the Congress of the United States to tap the submerged resources off the Texas and Louisiana coastline. But the largest yet to be constructed, and the first that can operate in 100 ft. of water, is *Mister Gus*, designed and built at Bethlehem Steel Corp.'s shipbuilding division in Beaumont, Texas. It is named for its owner, C. G. "Mr. Gus" Glasscock, wealthy independent oil man of Corpus Christi, Texas. Completed in November of 1954, *Mister Gus* is now drilling for Shell Oil Co. in 65 ft. of water off the Texas coast near San Luis Pass.

Basically, there are three types of drilling structures designed for offshore operations: the submersible barge, which has a drilling platform built on stilts at a definite height above the barge; the platform which is held at fixed height above the surface of the water by pilings or spuds driven into the ocean floor; and the barge which is raised above the water by means of piles driven into the ground.

Mister Gus falls into the second of these three categories. It is a completely dieselized unit consisting of a huge structure used both as a drilling platform and as a service platform containing quarters for the drilling crew, storage facilities and for the auxiliary equipment. There are three known methods of support for such a platform at sea—buoyancy, pile support, and bottom support. The Bethlehem design utilizes all three. Thus the total load can be distributed in any proportion desired and makes it possible to change the support, safely and quickly, if conditions are changed by the sinking of piling, the shifting of the ocean bottom, or other natural phenomena.

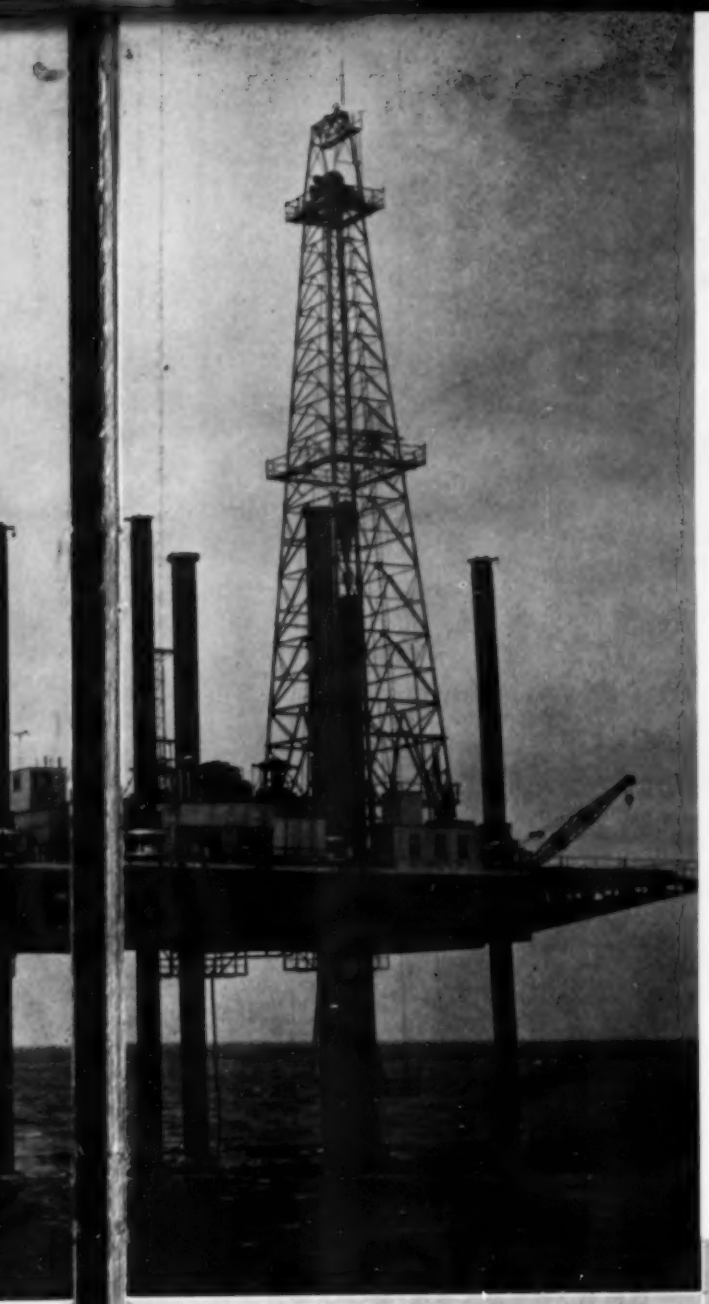
Fundamentally, the Bethlehem design consists of four principal parts. First is the foundation which is a barge of 4000 ton displacement which acts as a floating support for the entire weight. In the foundation are the ballast tanks which ultimately submerge the barge to the ocean floor. In the foundation also are the tanks for fresh water and fuel, watertight pump rooms containing the necessary machinery for pumping ballast and fuel.

The second part of the design is the working platform, 200x80x15 ft., upon which the derrick, machinery, storage facilities and living quarters are located. The foundation and the platform are joined by four heavily braced steel tubes through which piles are driven, and by two access tubes which are built into the foundation and extend up through the working platform. The access tubes transfer part of the load from the working platform to the foundation barge.

The third component part of the unit is the piling, 48-in. cylindrical hollow steel tubing 280 ft. in length. The piling extends through the pile tubes in the foundation and through another set of tubes running through the working platform. The piling is not connected to the foundation but is pushed into the floor of the sea and held to the foundation by two sets of clamps at each pile. The clamps are located about three feet above the bottom of the foundation barge, and the upper set is at the top of the pile tubes on the platform.

The fourth part of the design is the hydraulic connection between the piling and the platform. This device accomplishes the purpose of the design, which is to drive the piling into the ground. This is a Bethlehem-designed hydraulic jack actuated by two cylinders which can push the pile downward with a force of 827 tons and can pull upward with a force of 942 tons. These electrically driven Vickers hydraulic cylinders force the piles downward or extract them at the rate of one foot per minute in a series of five-foot strokes.

Oil men will find a marked similarity between the jacking device and the slips used to support drilling stems. The slips are wedge shaped and have one face roughened to develop friction. A requirement of the mobile drilling unit is that it must be able to move quickly from one location to another, or that it can be backed away from the well head in the event hurricane weather threatens. In normal



operating conditions, *Mister Gus* can be shifted to a new location within 12 hours.

When the platform is on its drilling location, the piles are lowered and driven into the ground by the hydraulic jacks, two at a time in diagonally opposite corners. When the entire weight of the structure is supported by the piles, the foundation barge is submerged, literally sliding down the piles as it sinks to the floor of the ocean. When it is on the bottom and out of the wave action of the sea, the foundation is clamped into place from inside the access tubes and the clamps themselves provide additional underwater bracing. The piles can be driven to a penetration of 100 ft. into the ocean floor, and they are long enough to permit operations in 100 ft. of water with the derrick floor 60 ft. above the surface. Its designers say the structure can withstand winds up to 125 mph.

The drilling platform has standard machinery arrangement and supports a 140-ft. steel derrick. The main power plant, located on the drilling deck level at the forward end of the platform, consists of four GM Diesel quads, each of the 16 engines rated at 500 hp. The plant has a maximum of 8200 hp at 1850 rpm and continuous operation rate of 2080 hp at 16 rpm. This power is fed into a National Type B compound with a Type 315 gear and fluid drive which operates the National 130 drawworks, the three National E-500 mud pumps and the rotary table. The drawworks has a rated input horsepower of 1300 with six hoisting speeds and a depth range of 10,000 to 16,000 ft.

The mud pump room and active mud pit are situated on the lower deck below the main engine room. The pumps have a maximum working pressure of 3500 psi. A synchronizing device, controlled from the drillers console on the derrick floor, permits the operation of two pumps in perfect synchronization. The third pump is for standby.

The method of transferring mud from the reserve storage bins in the service platform to the active pits under the engine room is one of the features of the Bethlehem rig. A 3-in. jet line picks up dry mud in the service platform and jets it back to the active pits through a 5-in. line. Four 150 kw, 440-v 3-phase, 60-cycle, ac generators, each powered with twin GM series 671 diesel engines, supply electric power for the rig and for the hydraulic jacks.

The two-story superstructure of the service platform contains air-conditioned living quarters for a crew of 31 men, complete with an electric galley and almost luxurious recreational facilities. The service platform also contains storage facilities for 2450 sacks of dry mud and a conveyor system from which mud is lifted into a hopper by means of a lift and thus fed into the jet line for transmission to the active mud pumps.

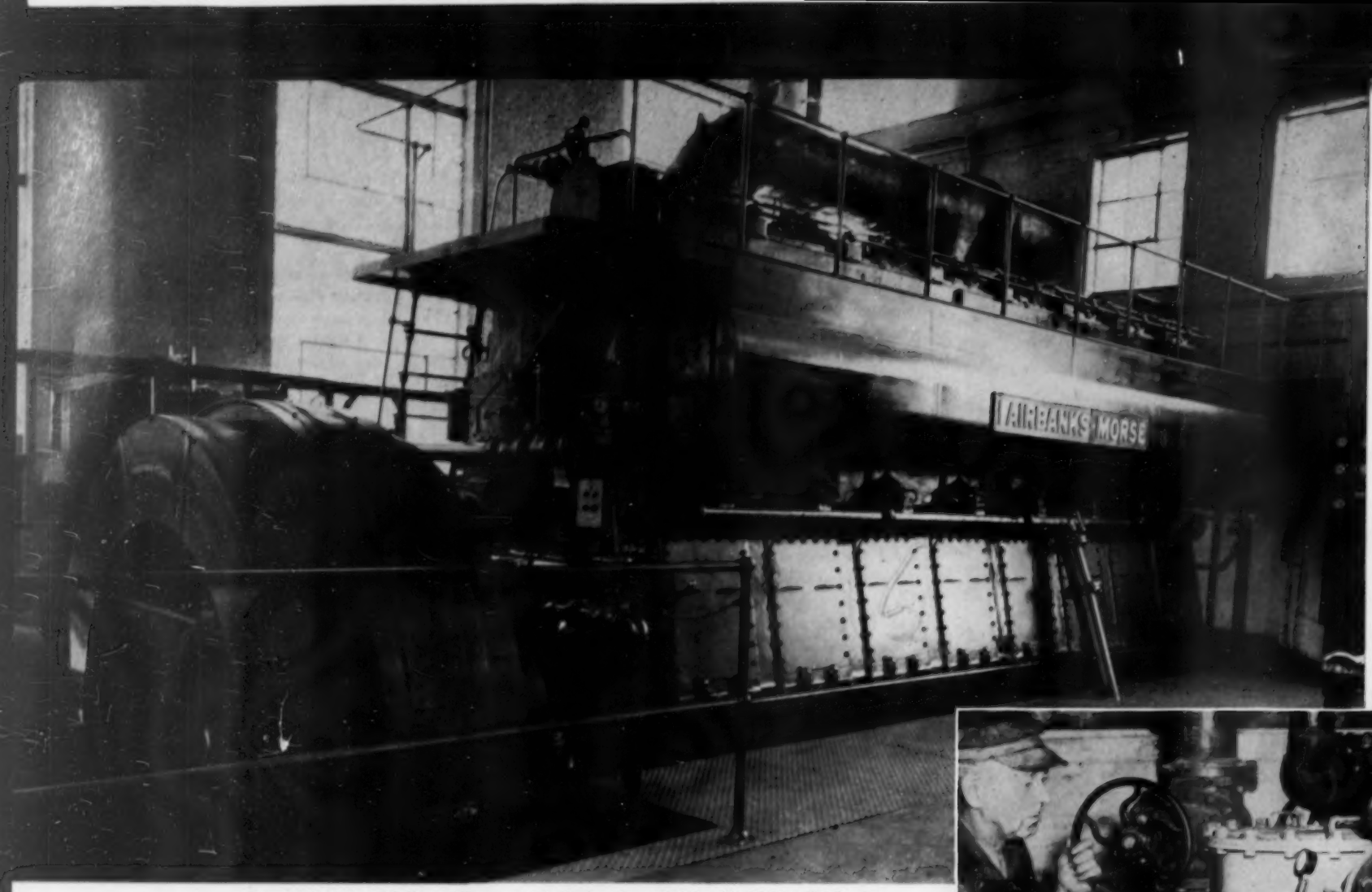
A Halliburton oil well cement unit and warehousing for tools, equipment and supplies, are also contained in the superstructure of the service platform while on deck are pipe racks for 2000 sq. ft. of pipe storage and a heliport. On top of the service platform housing is a 35-ton stiff leg derrick with a 70-ft. radius for loading pipe and material, and a 6-ton crane for landing personnel and small cargoes. This is necessary because weather conditions frequently are such that small boats can not land alongside the structure and it is necessary to hoist personnel aboard by means of the derrick.

Two tenders have been assigned to *Mister Gus*. *Barbara Storm* is an all-steel dieselized work boat 130x30x10 ft. which will be used for transporting fuel, water, mud and other drilling supplies. It is powered with twin installations of GM series 671 quads. It is equipped with Sperry pilot house controls, and has a speed of 12.5 knots. *Gus III*, a dieselized tug, will double as a crew boat.

Bethlehem engineers have been working on the basic design of the giant platform since 1948 when they first discussed preliminary ideas of a mobile unit that could be operated at sea under the trying conditions imposed by the Gulf of Mexico. In 1949 a tropical hurricane destroyed one off-shore drilling platform and damaged many others and launched a research program which has involved the research staffs of Bethlehem Steel Corp., Gulf Oil Corp., Gulf Research Corp., University of Michigan, Stevens Institute at Hoboken, N.J., Greer & McClelland of Houston, Texas, and Texas A & M College. The result was the Glasscock rig. Bethlehem engineers are now working on plans for a drilling platform which, they say, will be capable of drilling in 200 ft. of water.

Originally built in two sections, as shown in towing scene below, the rig now is one unit as shown at left. Bottom picture shows rig floating on barges—which are immersed on location as a foundation—and the piling which towers high above the rig until driven into the ocean bottom.

(Photos courtesy Shell Oil Co.)



Base load at the Cedarburg, Wisc., municipal plant is carried by this 2800-hp Fairbanks-Morse dual-fuel engine. Lube system includes an Air-Maze full-flow filter and a cellulose-packed Hilco by-pass filter.

REPORTER SURVEYS AIR-MAZE FILTER SYSTEM

IN this day of harder bearing metals, higher speed engines, and heavier bearing loads, engine lubrication and lubricating oil filters are constant subjects of interest and study. Those most vitally concerned, of course, are the engine users and manufacturers, the various oil companies, and the filter makers who are ever striving to keep abreast of more stringent demands. With such widespread interest in mind, this industrial reporter set forth to obtain field reports,—in this instance the Air-Maze Corp. version of the story on the full-flow filter in operation.

Obviously, this spot-check survey was not conceived to obtain descriptions of the many fine filters of varied design that give effective service in the world's diesel plants. This report is limited to one filter manufacturer's thinking, and to the experiences as applied to one engine-builder's units—but we hope the report will be indicative of the job that the full-flow-type filters are performing.

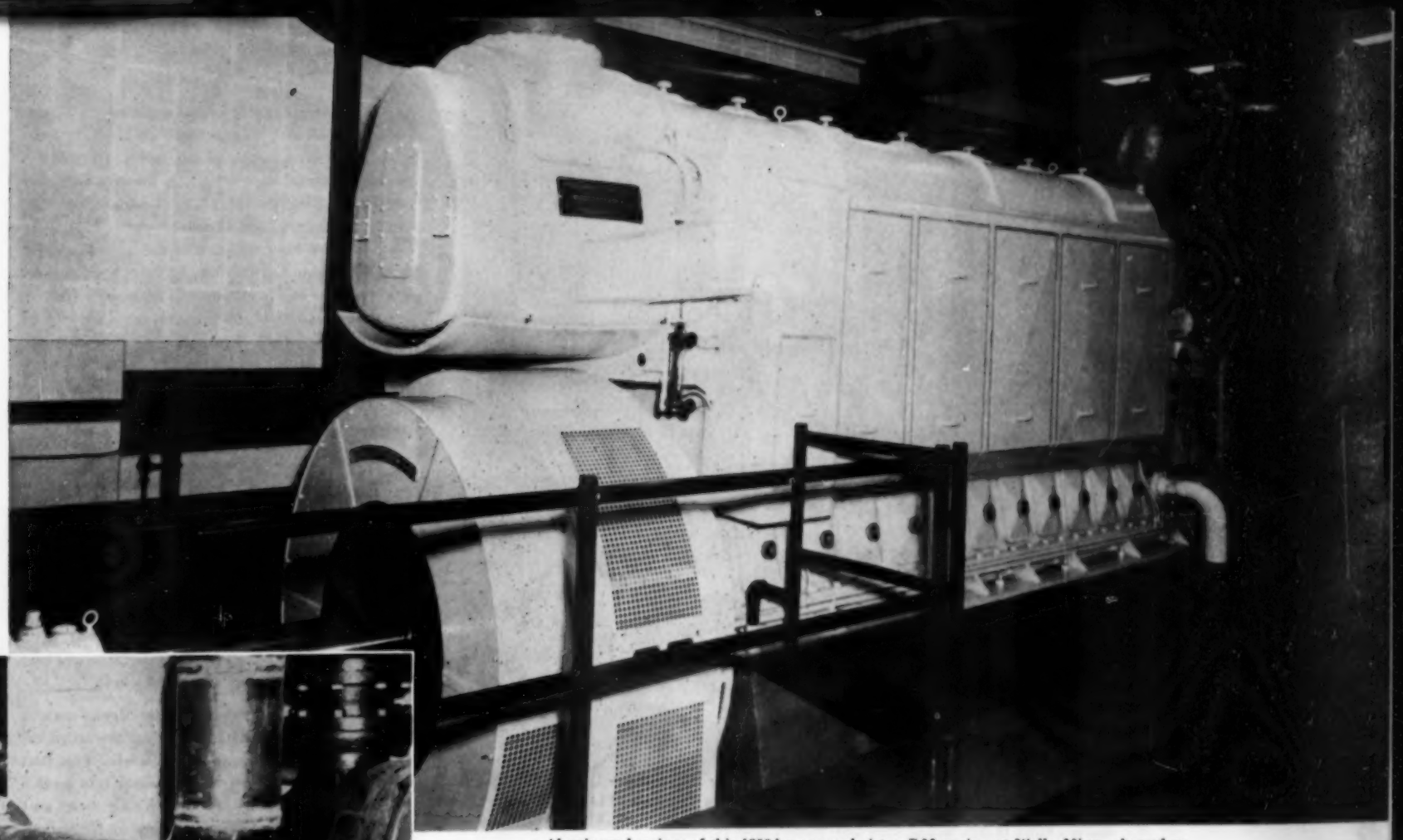
Material was gathered during visits to the Air-Maze Corp. factory in Cleveland; to the Fairbanks, Morse & Co. factories in Chicago and Beloit, Wisc., and to four diesel generating plants in three states where equipment built by the above-named manufacturers is in use.

An Air-Maze engineer outlined his views on how to get maximum protection for an engine. Among other things, he said the solution is to divide the filtration job. To remove hard particles large enough to damage engine bearings, he would use a full-flow filter with metallic elements that can be cleaned easily and re-used indefinitely. To remove soft contaminants, acids and dilution, he would bypass 10 to 15% of the lube through a filter with replaceable cartridges, utilizing such filtration materials as Fuller's earth or cellulose. Thus, the engine would receive full protection against harmful hard particles without needless sacrifice of space, dollars or operating time.

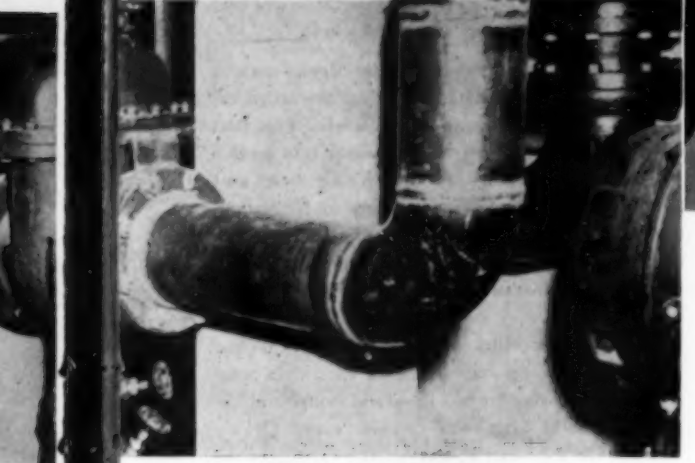
The job of the full-flow filter is to trap such particles as chips and core sand that can escape the most careful cleaning by the engine manufacturer, —dirt that may get into the engine during installation or repairs, dirt that may be in the oil on delivery or get into the oil during handling. The quantity of such hard particles may be small but they can do a lot of harm in the modern engine.

A talk with Fairbanks-Morse executives in Chicago, and inspection of the bearing production department at Beloit, revealed some of the reasons for F-M's increasing attention to full-flow lube filters. This engine builder is one of the pioneers in the introduction of aluminum alloy bearings for diesels. The metal used is much harder than the material it replaced and the bearing surfaces are smoother. The result is a bearing with excellent performance characteristics, a bearing that resists wear and continues in service for many years without replacement. Even in the case of a burned-out bearing, the solid aluminum bearing can be replaced quickly and with little expense. In only one respect is the new hard metal more sensitive: it can be damaged by a hard particle that might bury itself harmlessly in soft bearing metal. The answer to this problem, Air-Maze engineers say, is a full-flow filter that never will let through to the bearings any hard particle large enough to hurt them.

The next point to check was the ability of a moderately-sized filter with adequate flow capacity to provide the required protection. Air-Maze explained that the basic element in its full-flow liquid filter is a filter disc—a thin donut-shaped sandwich, composed of top and bottom layers of polished phosphor-bronze wire screen, bronze wire back-up screens, and, at the center of the sandwich, a reinforcing plate with radial passageways for flow of oil to the center. These elements all are held together with brass binding rings at inside and outside diameters. The disc-donuts then are stacked on a central perforated tube and oil must pass through top or bottom screens into the discs, then through the slotted inner reinforcing plate to the perforated center tube. There are, of course, other



Aluminum bearings of this 1800-hp opposed-piston F-M engine at Wells, Minn., showed no discernible wear after 23,000 hours. Lube oil is passed through an Air-Maze full-flow filter and a Honan-Crane by-pass filter.



Cedarburg engineer checks pressures at the Air-Maze full-flow filter. The all-metal filter was not cleaned in more than a year since no increase in pressure drop was noted.

By **WILLIAM H. GOTTLIEB**

full-flow filter designs. The one described is Air-Maze's answer to the problem.

Filter capacities range from 1.7 to 720 gal. per minute and the largest unit, rated to handle 720 gpm of lube oil with high contaminant content, measures only 20-3/8 in. in diameter and 27-7/16 in. in height.

But how much will such filters take out of the oil; how great is the protection they afford? To meet varied requirements, there are five sizes of filter media available, with square screen openings ranging from .0013 to .0097 inches. The most common opening size for lube filtration is .0052 in. but that does not tell the whole story. Our informant reported that much of the dirt collected by the filter is smaller than the size of the screen openings since the contaminants themselves form a filter-aids bed. One microscopic examination, he said, showed that more than half the particles collected were less than five microns in size. No hard particle large enough to harm bearings can get through. Next move was to visit some diesel plants for first-hand reports on the performance of these full-flow lube filters, properly back-stopped by cartridge-type by-pass filters.

Wells, Minnesota, has done its share of pioneering. Back in December, 1950, the municipal power plant installed a 1600-hp, 10-cylinder, Fairbanks-Morse opposed-piston diesel as an oil-burning engine. Then, in the fall of 1951, the unit was switched to natural gas and became one of the first of its type to operate as a dual-fuel engine. The lube oil used, a special high-detergent type provided by Standard Oil Co. (Ind.), is passed through an Air-Maze full-flow filter. In addition, a portion of the oil is by-passed from the pressure system through a Honan-Crane filter with cellulose-packed cartridges. In 1954, after 23,000 hours of operation, this engine was given a thorough inspection and Superintendent Howard E. Barton told this reporter that the aluminum bearings showed no discernible wear.

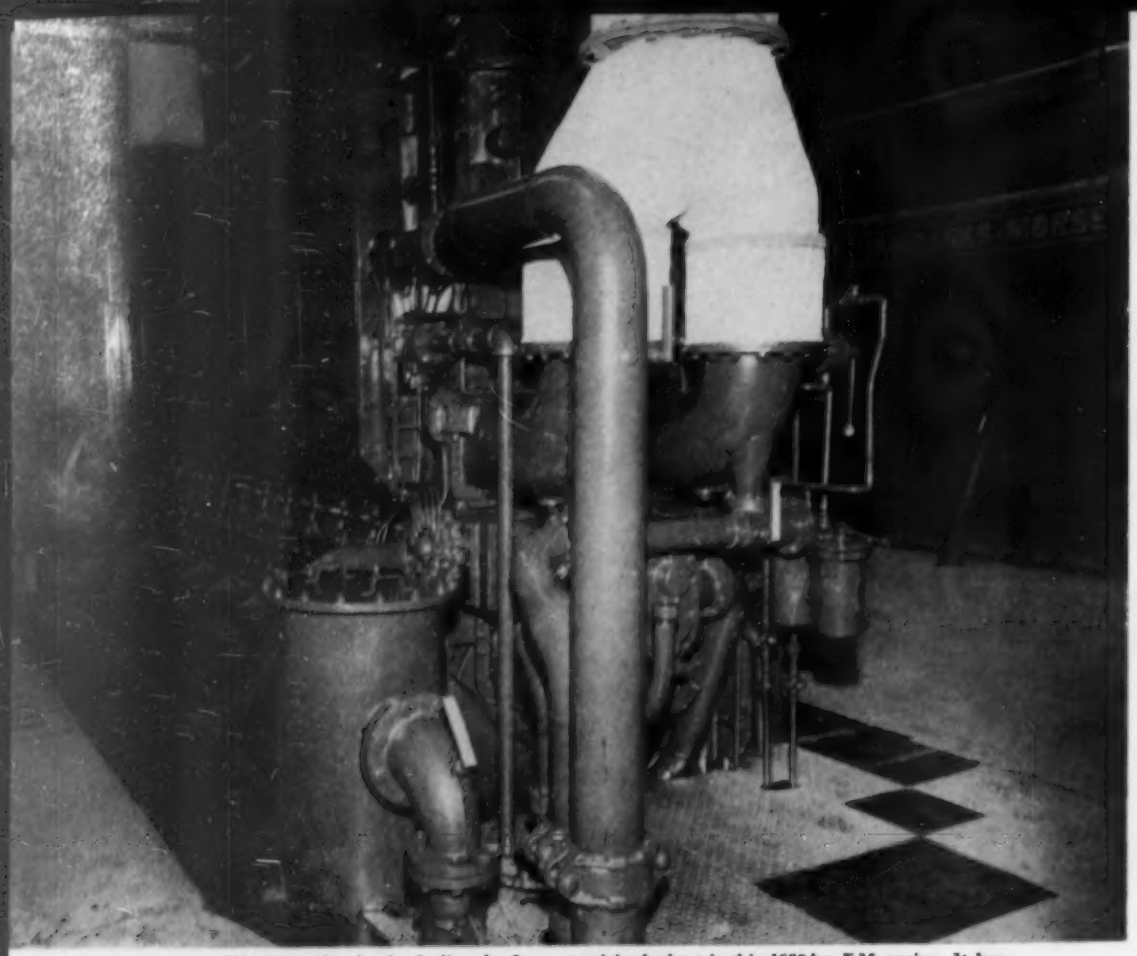
It is the practice at Wells to change by-pass filter cartridges at 2500 hours. The full-flow filters are cleaned only when the engine is down for scheduled maintenance. After engine overhaul, the full-flow filter takes a great deal of solid matter out of the lube and is cleaned four or five times in quick succession. This not only serves to protect and clean up the engine but eliminates clogging and replacement of by-pass filter cartridges.

The Cedarburg, Wisconsin, municipal power plant carries base load with a big Model 31AD18 Fairbanks-Morse dual-fuel engine rated at 2800 hp at 277 rpm. The engine is lubricated with Socony-Vacuum's Gargoyle DTE 4D. All the oil goes through an Air-Maze full-flow filter before reaching the bearings. Some of the lube is drawn from the crankcase by a motor-driven pump, put through a Hilco Hyflow filter with heater and cellulose-packed cartridges, then returned to the crankcase.

The engine went into service in August, 1953. More than a year later, it had not been found necessary either to clean the full-flow Air-Maze or change cartridges in the Hilco. Samples of lube were tested by Socony-Vacuum and on October 18, 1954, this report was rendered to Utilities Manager Palmer Schneider: "The following are the results of the analysis of the Gargoyle DTE 4D taken from your Fairbanks-Morse engine.

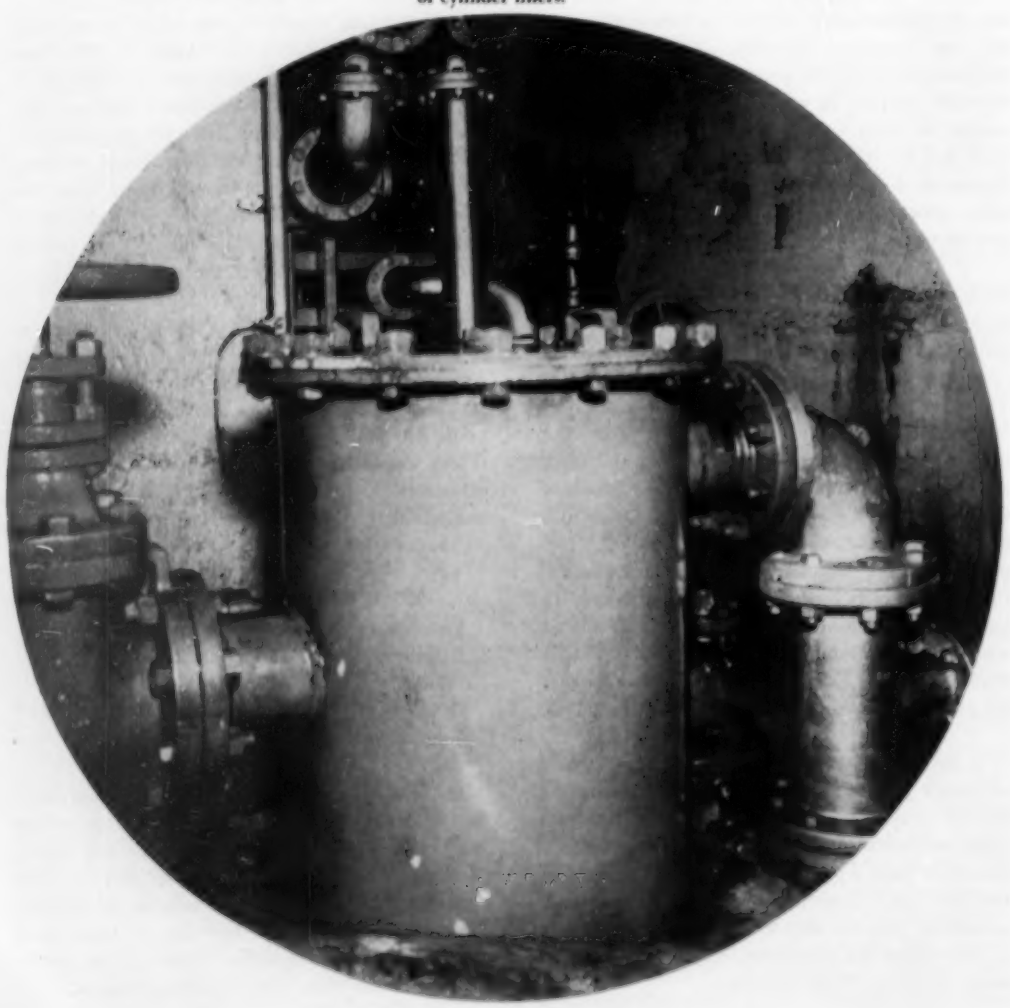
	Sample #1	Sample #2
Viscosity @ 100°F	903.8	919.5
Sediment in petroleum ether	Nil	Nil
Water	Nil	Nil
Dilution	Nil	Nil
Neutralization Number	0.09	

"Sample #1 is in excellent condition and was taken just before the screen. Sample #2 was taken from the crankcase by removing one of the side covers. It also is in excellent condition." At that time, Mr. Palmer could not report on bearing or cylinder wear because the engine had not yet been taken down for its first inspection. There was no observable deviation from new engine performance.



Newest engine in the Indianola, Iowa municipal plant is this 1680-hp F-M engine. It has the protection of two filters in its lubricating system. In foreground is the Air-Maze. There also is a Hilco Hyflow by-pass filter with Fuller's earth cartridges.

This Air-Maze full-flow lube filter serves a 1600-hp F-M opposed-piston engine in Thief River Falls, Minn. Inspection after 10,763 hours revealed no measurable wear in bearings or cylinder liners.



At Thief River Falls, Minnesota, the engines operate on fuel oil and there is more work for the lube filters. The city's newest prime mover is a 1600-hp Fairbanks-Morse opposed-piston diesel which was put on the line in 1952. The Standard Oil Co. (Ind.) detergent lube is passed through an Air-Maze full-flow filter and part of the oil is by-passed from the engine to a DP Repack Filter with repackable cellulose-filled cartridges. The by-pass filter is in continuous service, bleeding oil from the engine pressure system when the diesel is running or drawing the lube from the crankcase by means of a motor-driven pump when the engine is idle. Cartridges are repacked about once a month and the all-metal full-flow filter is cleaned twice a year.

Chief Engineer Morris L. Owen reports that the engine was given its first overhaul after 10,763 hours of operation and that a careful micrometer check could find no measurable wear in either bearings or cylinder liners. Samples of lubricating oil are checked once a month. Mr. Owen says that soft solids build up in the oil to some extent but that there are no particles hard enough or large enough to injure the bearings.

At Indianola, Iowa, two Fairbanks-Morse engines run normally as dual-fuel diesels but are called on at times of gas shortage to function wholly on fuel oil. The 2100-hp Model 31AD18 went into service in March, 1950, as an oil-burning diesel and switched to dual-fuel operation late in 1952 when natural gas became available. The engine is lubricated with Socony-Vacuum's high-detergent Tenopa 4D and the lubrication system includes a full-flow Air-Maze filter and a Hilco Hyflow by-pass filter with disposable cellulose-packed cartridges. When the engine ran on fuel oil, filter cartridges were changed every one to two thousand hours and the full-flow metal filter was cleaned every three months. On dual-fuel operation, the cartridges last 3500 hours and the metal filter need be cleaned only once a year. Plant Foreman George M. Boothe reports that a check after 6000 hours showed the rings in perfect condition and the aluminum bearings as good as new.

Indianola's newest engine, put on the line in December, 1953, is a 12-cylinder opposed-piston dual-fuel diesel rated at 1680 hp at 600 rpm. This engine is being lubricated with Sinclair Rubilene, a straight mineral oil, and it is served by an Air-Maze full-flow filter and also a Hilco Hyflow by-pass filter with Fuller's earth cartridges. Normally, lube is by-passed from the engine's pressure circuit but a motor-driven pump is provided to send crankcase oil to the activated clay filter when the engine is not in operation. The Air-Maze is cleaned and the Hilco cartridges repacked about twice a year.

This has been by no means an exhaustive study of the subject but some conclusions seem indicated. The modern diesel with such improvements as the new aluminum bearings can give long service with extremely small wear. In the plants visited, where the lubricating systems included a good full-flow filter and a good cartridge-type by-pass filter, the lube was invariably in good condition and wholly free of hard particles of harmful size. The aluminum bearings in engines with this protection showed no measurable wear.

DIESEL DREDGE BUILT TO SOLVE SPECIAL FLORIDA PROBLEM

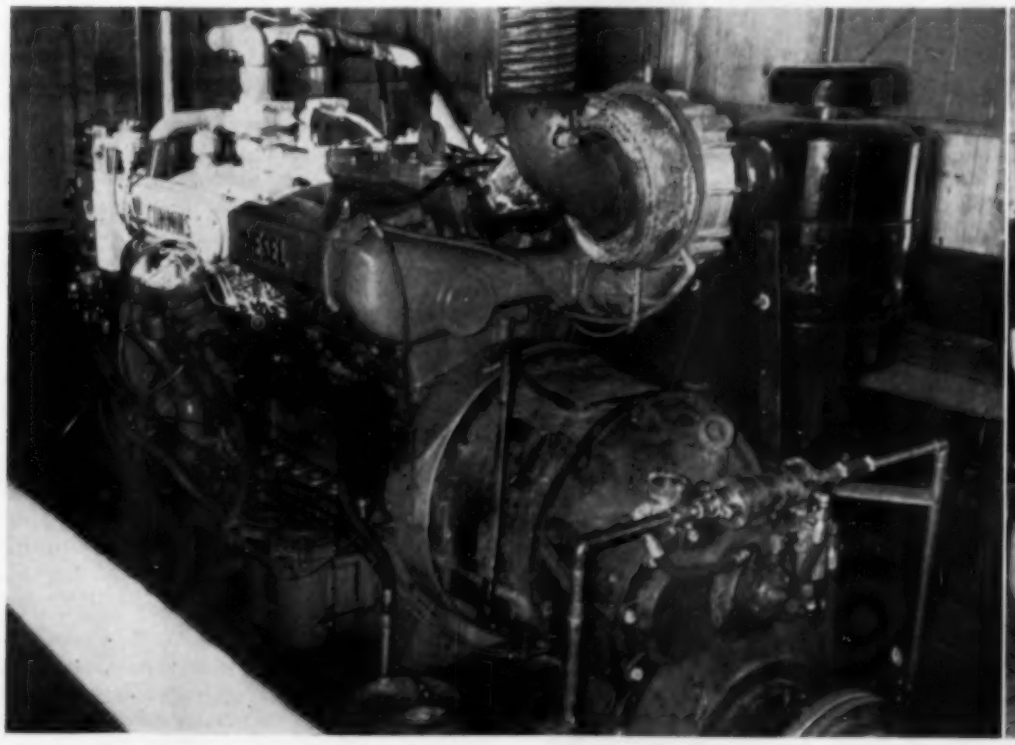
By ED DENNIS

CONVENTIONAL dredges are usually too heavy for the shallow water along the west coast of Flordia. Familiarity with these waters through the operation of a fishing fleet, led E. Turner & Sons, Naples, Fla., to design and build a small but power-packed dredge. Named the "Turner Dredge No. 1", it was completed in the fall of 1954, and has been busy reclaiming tidelands.

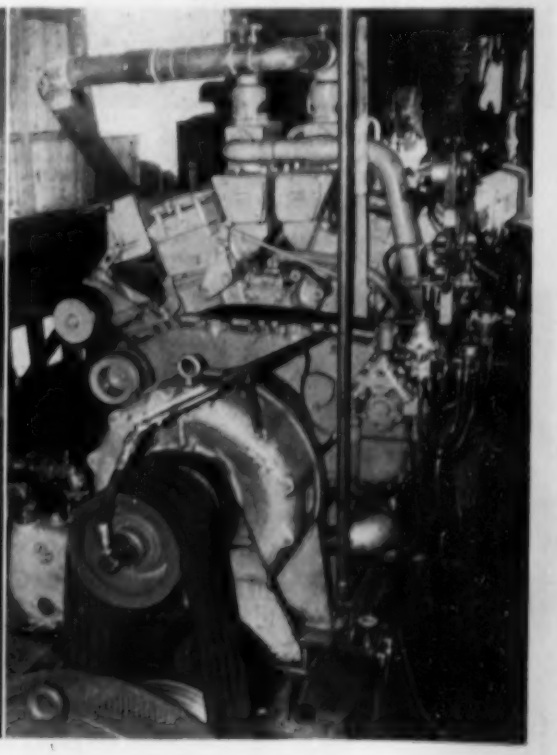
In designing the new vessel, Capt. E. Turner selected a model VTM 12-cylinder Cummins diesel for power. The engine is equipped with a Schwitzer-Cummins turbocharger. Operating at 1800 rpm, the engine has a continuous duty rating of 410 hp. At 2100 rpm, it develops 600 hp. The diesel's displacement is 1486 cu. in., and its overall dimensions are 111x44x59 in.

The dredge has scow-type construction. It is 45 ft. long, 24 ft. wide, and has a depth of only 4 ft. The Cummins diesel drives a Maddox 10x10 in. pump through a 3.9:1 Snow-Nabstedt reduction gear and a Falk steel coupling. Also, a 75 kw Star generator is powered through a Fawick front power take-off. This supplies electricity for all auxiliary equipment including the cutter and cutter head.

The model VT 12 Cummins diesel which was supplied by Cummins Diesel Engines of Florida, Inc., rated at 410 continuous hp and 600 max. hp. Also shown is the Snow-Nabstedt gears and the Falk steel coupling. On the side of the engine is the Bendix-Westinghouse air compressor for air controls.

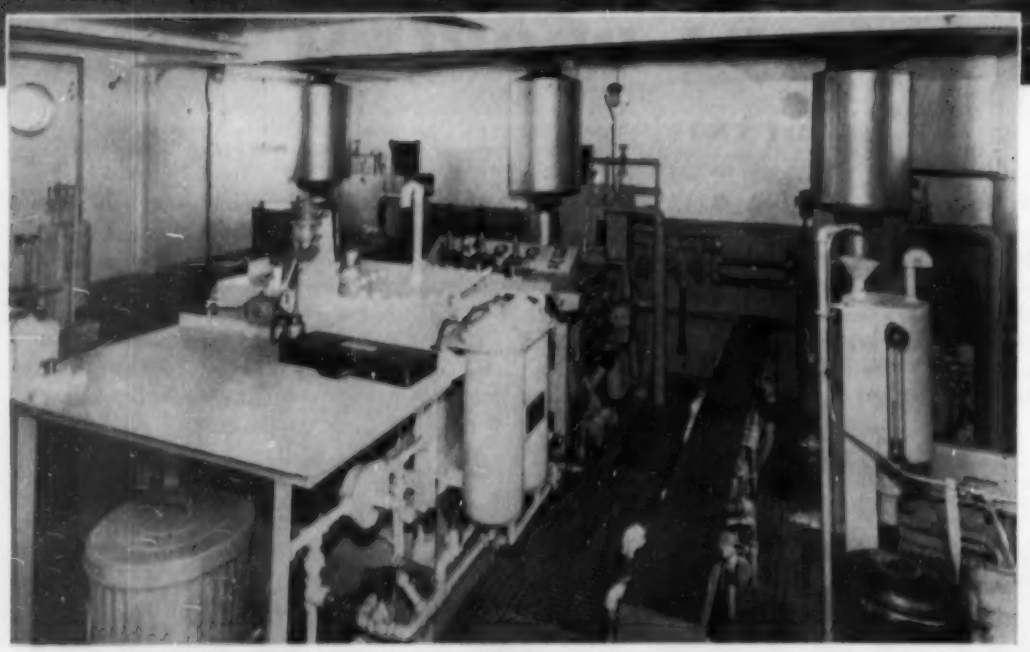


The front of the Cummins diesel showing the Fawick front power take-off which supplies power to the 75 kw Star generator with 8 "V" belts.



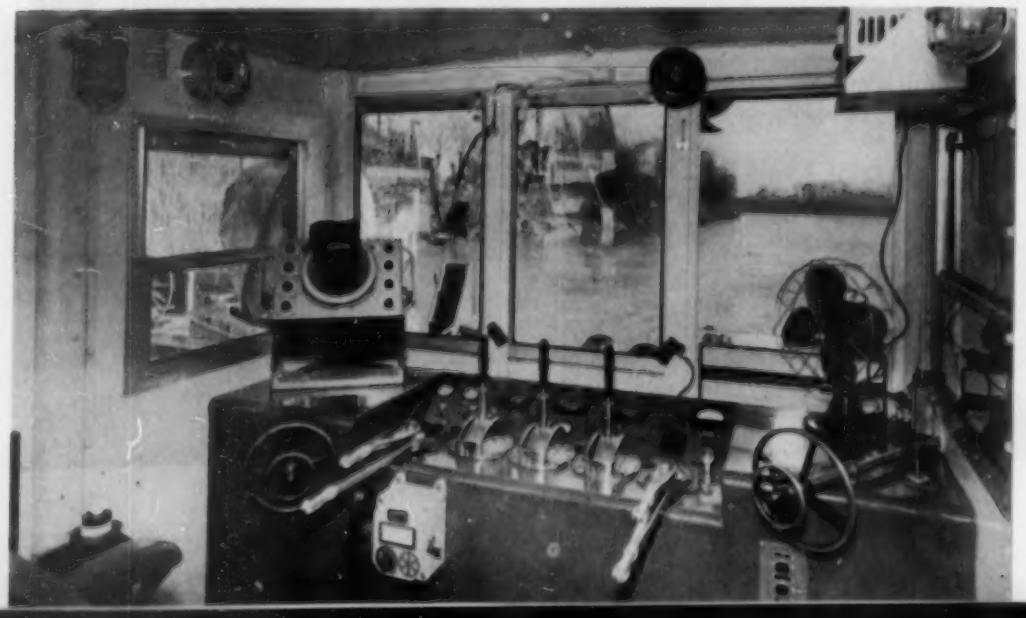
ARMY'S NEW SHALLOW WATER CRAFT

Self-Propelled Plastic Barge and Steel Towboat That Will Operate in Two-and-a-Half Feet of Water Are Designed To Use Standard Marine Diesels



Three 170-hp. Caterpillar diesels turn three tunnelized propellers on the light-draft steel towboat above, developed by the Army. Each main engine occupies a separate, watertight section.

The 94-ft. STI 2195, now in commercial service, is equipped with Westinghouse Air Brake controls, has three steering and two flanking rudders to provide optimum maneuverability.

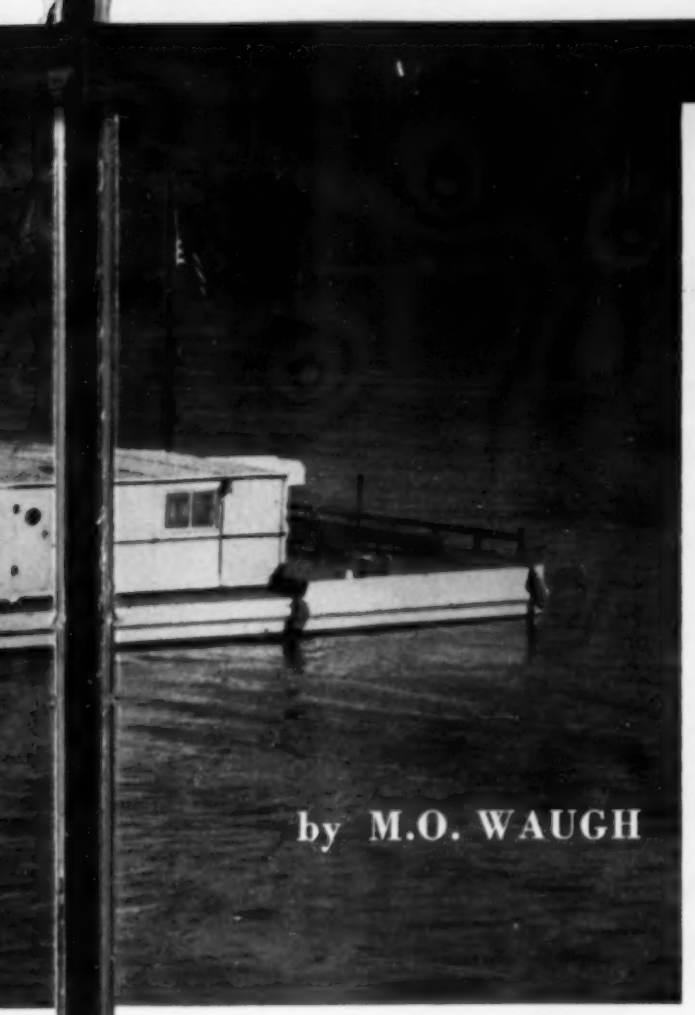


WHEN military operations must be carried on in enemy territory, lack of rail facilities, roads, and navigable channels often present problems that are about as serious as presence of the enemy. In such primitive areas, transportation of personnel, equipment and supplies is almost impossible. To counteract such unfavorable contingencies, the U.S. Army's Transportation Research and Development Command at Fort Eustis, Va., has been developing and experimenting with various types of small boats for shallow waters.

A 51-ft. self-propelled plastic barge and a towboat with a designed waterline of only 2½ ft. are two of the most recently completed and tested pilot models, according to K. Telford Marshall, TRADC project engineer. The self-propelled barge can push or pull small fleets of cargo barges. Its draft, light, is 12 in., loaded with five tons, 21 in. Speed with a tow is 7.5 mph.; without tow, 14 mph. Model tests of the hull, conducted at the University of Michigan Naval Test Tank, helped determine the horsepower requirements—140 hp on each of two shafts. These tests also indicated the best shape for the propeller tunnels.

Use of diesel engines in a larger barge, completed earlier, proved so satisfactory that diesels also were specified for the new lightweight material barge,—BSPI 6671. Each barge is powered by two GM Detroit Diesel 671 engines. To enable the barge to operate in muddy waters without damaging the engines, outboard heat exchangers are set in the bottom of the hull.

The barge was designed by W. R. Chance Associates, Arlington, Va., and the prototype was built by Englander Co., Inc., in the plastic division of its Baltimore plant. The design called for section-



by M.O. WAUGH

alization of the vessel to facilitate overland transportation. Ready for service, it weighs 10 tons.

Considerable research was necessary because no reinforced plastic structure of this length had ever been built. Existing reinforced plastic materials used in marine construction lacked the necessary rigidity for such length. In addition, the type of material had to be extremely light in weight to give the minimum draft sought. A unique "sandwich" type material was developed.

Sandwich construction utilizes an inner and outer skin of plastic polyester resin (made by Celanese), reinforced by layers of fiberglass cloth. Between the outer and inner skins is a cellular honeycomb material of cotton duck, impregnated with phoenolic plastic resin. The development of satisfactory techniques for fastening the honeycomb cells to the layers of the sandwich was a major victory.

The barge consists of two main hull sections, each limited to a 10-ft. width for rail shipping clearances. The forward section supports two push knees on the bow, and two hand-operated warping winches. Four inter-connected fuel tanks are below the forward deck. There also is a cargo hold.

The aft main hull section contains the engine room, pilothouse, crew's quarters, day tank, shafting and propellers. While the hull is of sandwich construction, the decks are of solid laminated material, left translucent to provide natural lighting in the engine room. Six watertight pontoons, bolted along each side of the vessel, provide longitudinal strength, buoyancy and stability. Watertight access openings in the shaft tunnels provide another unique feature in that they permit removal of obstructions that may become jammed in the propellers. The inboard and outboard shaft bearings are of rubber type, lubricated by a water pump.

The barge has dual pilothouse controls with manual steering. Electrical power is furnished by a 40 amp, 24-v generator on each main engine. Shipped in sections, the barge can be assembled without special tools or equipment. The sections can be transported by rail, air or truck. By retracting the masts and searchlight, the boat can pass under bridges which clear the water by only eight ft.

Although of welded steel construction, the STI 2195 (Small Towboat Inland), has some of the utilization features that make the plastic barge attractive to the U.S. Army. It, too, was designed for knock-down shipment and easy assembly. The pilothouse has sufficient elevation to give good visibility over the tow ahead, but is retractable so that the towboat can pass under bridges having only eight ft. clearance. Again, model tests were made at the University of Michigan to determine hull resistance and wake reactions in both deep water and simulated shoal water conditions.

The molded length of the towboat is 96 ft., breadth, 23 ft., depth, 4½ ft., with a designed water line of 2½ ft. There are accomodations for seven crew members and three passengers. Fuel oil capacity is 11,300 gal., operating speed in 5-ft. pool water is at 7.5 mph.

Powered by three 170 hp Caterpillar marine diesels, turning three 3-blade, 36 in. propellers, and fitted with three steering and two flanking rudders, the towboat met the Army's requirements for high thrust at towing speeds and optimum maneuverability. The prototype was built by the Nashville Bridge Co., Nashville, Tenn. After satisfactory Army tests, the pilot model was put into commercial service by the Bull Towing Co., Joliet, Ill.

Two GM Detroit Diesel engines on Delco generators provide electricity. A special Nashville Bridge Co. separate internal skin cooling system is provided for each of the five diesel engines aboard. This avoids the difficulties usually encountered in keeping engines cool while operating in muddy water or slush ice.

The hull consists of nine separate watertight sections. Flat-bottomed amidships, there are three tunnels aft for the propellers. The three forward sections contain the pilothouse, two staterooms, and the potable water tank. All machinery is located in the three after sections. Each outboard after section contains one main engine, one generator set, and steering ram with its motor-driven pump. The center after section has one main engine, switchboard, two air compressors and other auxiliary equipment.

Both of the experimental craft described above were designed so that if mass production ever becomes necessary, any of several standard marine engines and generator sets can be used.

List of Equipment

(Towboat STI 2195—Small Towboat Inland.)
Main engines— (3) Caterpillar Marine Model D-337 rated 170 hp.
Reverse & reduction gears—Snow-Nabstedt 3758, ratio 3:1.
Controls—Westinghouse Air Brake.
Propellers— (3) Columbian Bronze, 3-blade, 36 in.
Fuel oil transfer pump—Viking.
Fuel oil filter—Briggs.
Exhaust silencers—Burgess-Manning.
Fire pumps—one each, Marine Products and Economy Pumps.
Air compressors— (2) Westinghouse Air Brake 13.2 cfm at 250 psi.
Steering rams and hydraulic power rack—Vickers.
Engine alarm panels—Viking Instrument.
Auxiliary engines— (2) GM Detroit Diesel 71s.
Generators— (3) Delco Model 1-523 arranged for parallel operation. Each is 20 kw, 208/120-v, 60-cycle ac, 3-phase.
(Plastic Barge BSPI 6671—Barge, Self-Propelled, Inland Waterways.)
Engines— (2) GM Detroit Diesel 671s.
Reduction gears—Allison.
Controls—Panish.
Fuel oil transfer pump—Gross.
Priming and bilge pump—Marine Products.
Electrical control panel—Powercon.
Fuel oil gauge—Liquidometer.

Stern section of new plastic self-propelled barge, designed in three easily-assembled sections so it can be shipped by air, rail or truck. Research resulted in "sandwich" type, lightweight construction.

Twin 140-hp. GM Detroit Diesels power the prototype of Army's new shoal-water work boat. Allison reduction gears and Panish controls were used. Boat will operate in one-foot depth when empty.

YOU TOO CAN USE HEAVY FUEL

DECATUR, INDIANA, REPORTS ON CENTRIFUGING RESIDUAL FUEL

By L. C. PETTIBONE*

CONTINUOUS centrifuging of residual fuel for diesel engine use has been successfully initiated in the Public Utilities plant in Decatur, Ind. Faced with a condition where over 200,000 gallons of storage facilities were filled with a residual fuel oil having up to 9% solids by volume, we were forced to develop a system to decrease this high percentage of solid content. Standard methods of fuel oil purification could not cope with this situation; specialized centrifugal separation equipment was the only means of preparing this oil so that it could be burned. Other plants faced with the problem of burning heavy oil may well find the Decatur Public Utilities experience of interest.

In 1954 we completed the installation of a Hamilton Model 1221-SA diesel engine rated at 5380 bhp at 240 rpm. This two-cycle engine has 12 cylinders with 21½-in. bore and 27½-in. stroke and drives a generator rated at 4250 kw, gross, or 3810 kw, net, at 240 rpm. The diesel engine supplements our steam turbine power plant.

When selecting the engine, one of the requirements was that it be capable of burning heavy residual fuel of the cheapest type. It was specified that fuel heating and treating equipment be furnished, capable of handling cheaper fuels. Before the installation was completed, we filled our storage facilities with a local No. 5 fuel, purchased at an excellent price. (See Table I.) When we got ready to burn this oil, we found that, evidently, it was very unstable and had sludged to a large extent in the storage tanks. The original oil had a refinery analysis of 0.3% BS&W. Now it had as much as 9% solids. As a result, the two standard type fuel oil centrifuges supplied as original equipment with the engine would only function for a few minutes before their bowls would be entirely filled with solids. An impossible situation developed as we were cleaning the separator bowls more of the time than we were running them.

TABLE I

	Refinery Analysis	Actual Analysis
Specific Gravity	.9431	.9404
API Gravity	18.70	19.0
Viscosity SSU @ 100°F	537	540
SSU @ 210°F	64.5	65.0
Carbon Residue % by weight	10.24	.....
BS&W % by volume	0.30	4.0
Sulphur % by weight	0.75	.....
Flash Point	265	275
Fire Point	310	320
Ash % by weight	0.034	0.035

We learned that The De Laval Separator Co. had adapted a continuous nozzle machine for operation on residual fuel oil that could discharge a concentrated slurry of solids and would operate continuously over long periods of time without the need of cleaning the bowl. We learned that two of these machines were in operation on the continuous treatment of No. 6 fuel oil for use as gas turbine fuel in the Central Vermont Public Service Corp., Rutland, Vt., and that De Laval had been operating one of these machines on No. 6 oil in their own power house for two years. Therefore, we decided to be "guinea pigs" for diesel plant operation, as the oil purified at the De Laval plant had been burned under a steam boiler. All arrangements were completed and a De Laval Model AC-VO Nozzle-Matic Heavy Fuel Purifier, complete with auxiliary equipment, was installed.

The fuel to be purified is normally heated to approximately 200°F in order to reduce viscosity and is passed through the twin feed strainer into the top of the revolving centrifuge bowl. The high centrifugal force in the bowl throws the heavier components such as sludge, dirt and water to the outside where they discharge through the nozzles located in the bowl wall. Along with the sludge, a quantity of oil is also discharged. The mixture of oil, water and solids passes into a small collecting tank under the machine and is recirculated back into the bowl through the flush assembly.

When recirculated, the mixture is directed to the nozzle openings in the bowl wall. The oil present in this mixture is separated and passes to the center of the bowl where it discharges as purified oil. The mixture is recirculated until the BS&W content reaches a range of 20 to 50% and then, periodically or continuously, a small quantity of the concentrated sludge is drawn out of the system.

The operation of the continuous centrifuge was an immediate success. At times our No. 5 oil ran as high as 9% solids. The De Laval AC-VO reduced the BS&W content down to less than 0.05%. When handling this oil at a capacity of 400 gph, it was necessary for us to draw off from 20 to 30 gph of concentrated sludge having solid content of from 50 to 70%. We concluded that if this continuous centrifuge could purify this shovel-consistency oil, it could handle any oil. Therefore, we started operations on a No. 6 oil with full confidence, after working off the 200,000 gallons of very poor No. 5 oil. The No. 6 oil had the following specifications:—

Specific Gravity	0.9736
API GRAVITY	13.9
Viscosity SSU @ 100°F	5520
SSU @ 180°F	458
SSU @ 210°F	241
BS&W % by volume	1.40
H_2O by distillation % by weight	.36
Ash % by weight	.048
Flash Point °F	340
Fire Point °F	410
H.H.V BTU/#	19,150
L.H.V. BTU/#	18,150

The continuous centrifuge had no trouble purifying this heavy residual fuel oil and our diesel engine had no difficulty in digesting it. Our Chief Engineer, Les Mitchell, decided that best purification results would be obtained with minimum oil viscosity. For awhile we centrifuged at temperatures as high as 270°F even though we knew the higher temperatures meant additional strain on bearings and other centrifuge parts. Actually, in heating the oil from 250 to 270°F, we only reduced the viscosity some 10 SSU from 100 SSU at 250° down to 90 at 270°F. The maximum temperature used for purification now is 250°F as we have learned that almost equivalent results in purification can be obtained with oil of 150 SSU as with oil of 100 SSU.

Table II compares specifications of two batches of

*Superintendent of Public Utilities, Decatur, Indiana

Les Mitchell, chief engineer, and L. C. Pettibone, superintendent, Decatur, Ind., public utility plant, in front of 5380-hp Hamilton engine.

DeLaval Nozzle-Matic fuel oil purifier and auxiliary equipment which handled shovel-consistency fuel.

oil, and illustrates the differences between unpurified and purified oil. Batch A was purchased from the same source as that described above. Batch B is from a new source, and it will be noted the BS&W content of the unpurified oil is much lower. The carbon residue, sediment by hot filtration, and sulphur content also were much less than the previous No. 6 oil burned.

The slurry from the heavy fuel purifier will vary from 20% solids up to as high as 75%. Solids from some oils will concentrate further than the solids from others. Average concentration is in the range of from 20 to 50%.

We have no disposal problem in connection with the sludge as a local road contractor is quite happy to buy this slurry from us to mix with his regularly purchased road oil. His truck picks up the material at our plant and he pays us 1½¢ per gallon. During November 1954, we centrifuged 78,828 gallons of No. 6 oil for which we paid 6-¾¢ per gallon. From this quantity, our centrifuge removed 1079 gallons of sludge (1.37%), and this was sold at 1½¢ per gallon for a total return of $16.18. When we take into account the shrinkage, the cost per gallon for the burnable fuel was 6-7/8¢ per gallon, not taking into account the fraction of a cent per gallon cost for centrifuging the oil. The saving in our fuel bill for the month of November amounted to approximately $3600 as diesel oil sells for 11½¢ per gallon.

During December, we purchased and burned 66,781 gallons of oil from which we removed 762 gallons of sludge (1.14%), sold to the same road contractor. During December, the oil had a lower BS&W content so we removed less sludge. After centrifuging the purified fuel, it is passed through one or two parallel waste pack filters before burning in the diesel engine. Everything indicates that the continuous centrifuge is really doing an excellent job as we have found it necessary to change the filter elements only once each three months.

Our average fuel rate is close to 15 kw per gallon and could be even slightly better if we were using the diesel engine for base load. However, a 5000-kw steam turbine generator is handling base load and the diesel engine is being used for peak load. Our peak varies from 6000 to 7600 kw and extends over 17 hours each day. After midnight, our load drops to the range of 2800 to 3400 kw. In order to shut down the steam turbine power plant, it would be necessary to bank the fires under the boiler and this would be too expensive a proposition as it would require one-half ton coal per hour just to keep the fires banked. Therefore, as it costs practically nothing to shut down the diesel plant and to swing it on when required, this is our present operation.

Our load is growing fast and it is likely that additional diesel capacity will be installed in the near future. It would be possible for us to save an additional $35,000 to $40,000 per year if we converted to 100% diesel operation on residual fuel. On the present unit, the savings per hour of operation at full load due to the difference in fuel costs between No. 2 and No. 6 amounts to approximately $12 an hour or $288 per day. The present engine is being operated for from 18 to 20 hours per day at an average load factor of 70%. All of the fuels that we burned have been well purified by the continuous Nozzle-Matic Purifier and have burned with a clear exhaust. No unusual piston ring or liner wear has been experienced and we have had only one injection nozzle plugged in 3800 hours of operation.

TABLE II

	BATCH A		BATCH B	
	Unpurified Oil	Purified Oil	Unpurified Oil	Purified Oil
Specific Gravity	.968	.968	0.952	0.952
API Gravity	14.7	14.7	17.1	17.1
Flash Point	315°F	320°F	310°F	315°F
Fire Point	.....	.....	375°F	375°F
Viscosity SSU @ 100°F	.....	.....	1811	1805
SSF @ 122°F	225	224	81	81
SSU @ 180° F	389	377	166	162
SSU @ 210°F	202	197	97	96
Carbon Residue % by weight	15.09	13.73	4.32	1.31
Sediment by hot filtration	0.063	0.008	0.024	0.006
Water by distillation % by weight	0.04	trace	trace	none
BS&W % by volume	0.60	0.20	0.22	0.03
Ash @ 550°c % by weight	0.045	0.021	0.033	0.014
Sodium % by weight	0.0018	0.0014	0.0019	0.0006
Sulphur % by weight	1.14	1.07	0.824	0.793

REPOWERED "LUCY" HAS MORE SPEED

Six-Ton Fairbanks-Morse Diesel Replaces Higher Rated 40-Ton Engine; Adds 1-1/2 Knots to Speed of Boston Motor Tanker

By DOUGLAS SHEARING

THE largest diesel engine sold off the floor at the New York Motorboat Show in 1954 has made news of another sort during the intervening year. The 375 hp, 5¼x7¼ in. Fairbanks-Morse opposed-piston has greatly increased the productivity of the M/V *Lucy*, a 5000-bbl. motor tanker operating in Boston Harbor. Installation of the diesel increased the vessel's speed from 6 to 7½ knots. This increased the number of pay loads she can carry each year. At the same time, the *Lucy's* average fuel consumption was cut 7%. Thus, in addition to making news, the engine is making money for the Boston Fuel Transportation Co., working every day of the year.

In addition to the increases in speed, availability, and fuel economy already introduced, the engine can add further to the *Lucy's* income potential by allowing her cargo capacity to be expanded about 200 barrels. At her owner's discretion, such an increase is possible because of the 34-ton weight difference between the *Lucy's* new and old propulsion engines. The 400 hp, 228 rpm diesel formerly installed had a total weight of 40 tons. The new 375 hp engine, on the other hand, weighs only six tons, including all auxiliaries, reduction gears and air-operated clutch. This means that more than 200 barrels of oil could be added to the *Lucy's* tonnage without affecting her design characteristics. At the present time this weight difference is compensated for by carrying additional ballast. Also, the new engine is shorter by nine feet.

Decreased running time and increased fuel economy have been the O-P's chief contributions to date. Since she was repowered, the *Lucy* can carry the same amount of cargo 1½ knots faster, at speeds of 7½ and 8½ knots, and can complete more pay-load trips per month. On her initial trip from New York to Boston, the vessel actually averaged 9.1 knots. It would be reasonable to assume that with this higher utilization of power, fuel consumption would also be higher. The opposite, however, is true. In the O-P's first 113 hours of operation, despite the fact that the engine was being broken in at the time, a total of 3000 gallons of fuel oil were consumed at an average rate of 26½ gallons per hour. This compares to an average fuel consumption rate of 28 gallons per hour for the former engine in the *Lucy*.

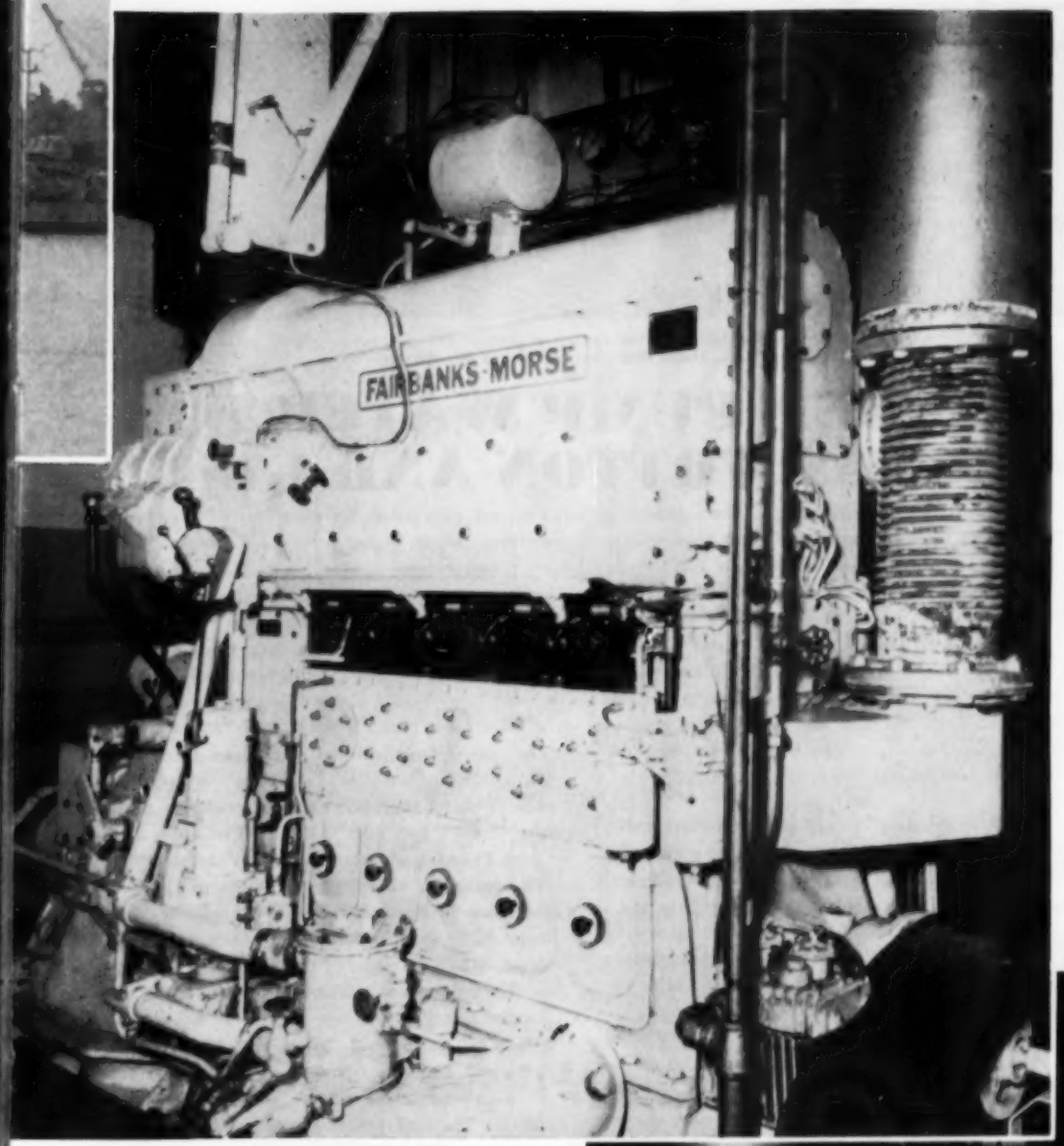
The M/V *Lucy* measures 138.3 ft. in overall length, 26 ft. in breadth, 11.5 ft. in depth, and registers 382 gross tons. She is of all-welded steel construction, with her engine room and superstructure aft, and was originally built at Mariner's Harbor, Staten Island, in 1932. She originated the Boston Fuel Transportation Company's operations at Boston and is a particular favorite among the operating personnel of the five-tanker fleet. It is said that in order to get a berth aboard the Lucy a man has to shoot one of the crew members first. Since being repowered at the Coastal Drydock yard, Staten Island, the M/V *Lucy* has been averaging more than a trip a day. She carried 80,905 barrels of gasoline, kerosene, fuel oil and other petroleum products on 17 round trips in a 30-day period. She has a crew of seven, including a captain, a mate, two deckhands, a cook and two engineers.

The *Lucy's* new 5-cylinder engine operates in the *Lucy's* particular type of service at 350 hp and 1120 rpm. It drives a single 66x44 in. manganese-bronze propeller, through a set of 3.97:1 reverse-reduction gears. To facilitate maneuvering, the engine is equipped with an air-operated, planetary-gear type clutch. The Tobin bronze tailshaft is equipped with Cutless rubber stern bearings.

Fuel oil for the Fairbanks-Morse engine is stored in a 4000-gal. storage tank aft of the engine room. From storage to the individual cylinders, the fuel is filtered three times, first through a single-cartridge strainer on the suction side of the transfer pump, second through a similar type strainer on the discharge side of the day tank, and third through a duplex filter on the pressure side of the engine supply pump.

A high-detergent type lube oil, stored in a 100-gal. overhead storage tank, is used. It is circulated under pressure to all working surfaces and to the pistons for cooling by means of a built-in, rotary-gear type pump. Cooling is accomplished in a shell-and-tube type lube oil cooler, equipped with an automatic temperature-control valve, which by-passes raw water around the cooler to keep the lube at the most efficient operating temperature. As the lube returns to the engine sump from the cooler it passes through a full-flow strainer; as it is discharged from the built-in circulating pump, a small amount is continuously by-passed through a micronite-element filter and returned to the sump.

Makeup for the closed jacket water system is drawn from a 2500-gal. fresh water tank and is circulated by a built-in, engine-driven pump through the engine and a shell-and-tube type heat exchanger, equipped with an automatic by-pass valve. Fresh water is also used in the raw water circuit, being drawn from a separate 5000-gal. storage tank located under the main engine. A built-in pump circulates it through the lube cooler and heat exchanger. It is cooled by a skin cooling system.



Starboard side of the 375-hp Fairbanks-Morse diesel showing Woodward governor, Purolator duplex fuel oil and lube oil filters, Air-Maze lube strainer, and Quincy engine-driven compressors.

Scavenging air is drawn through an oil-bath filter, mounted on the reduction-gear end of the engine, and is sent to the cylinders by means of a built-in, positive-displacement blower. Starting air at a pressure of 250 lbs. is supplied by an engine-driven compressor and is stored in four bottles on the forward bulkhead of the engine room.

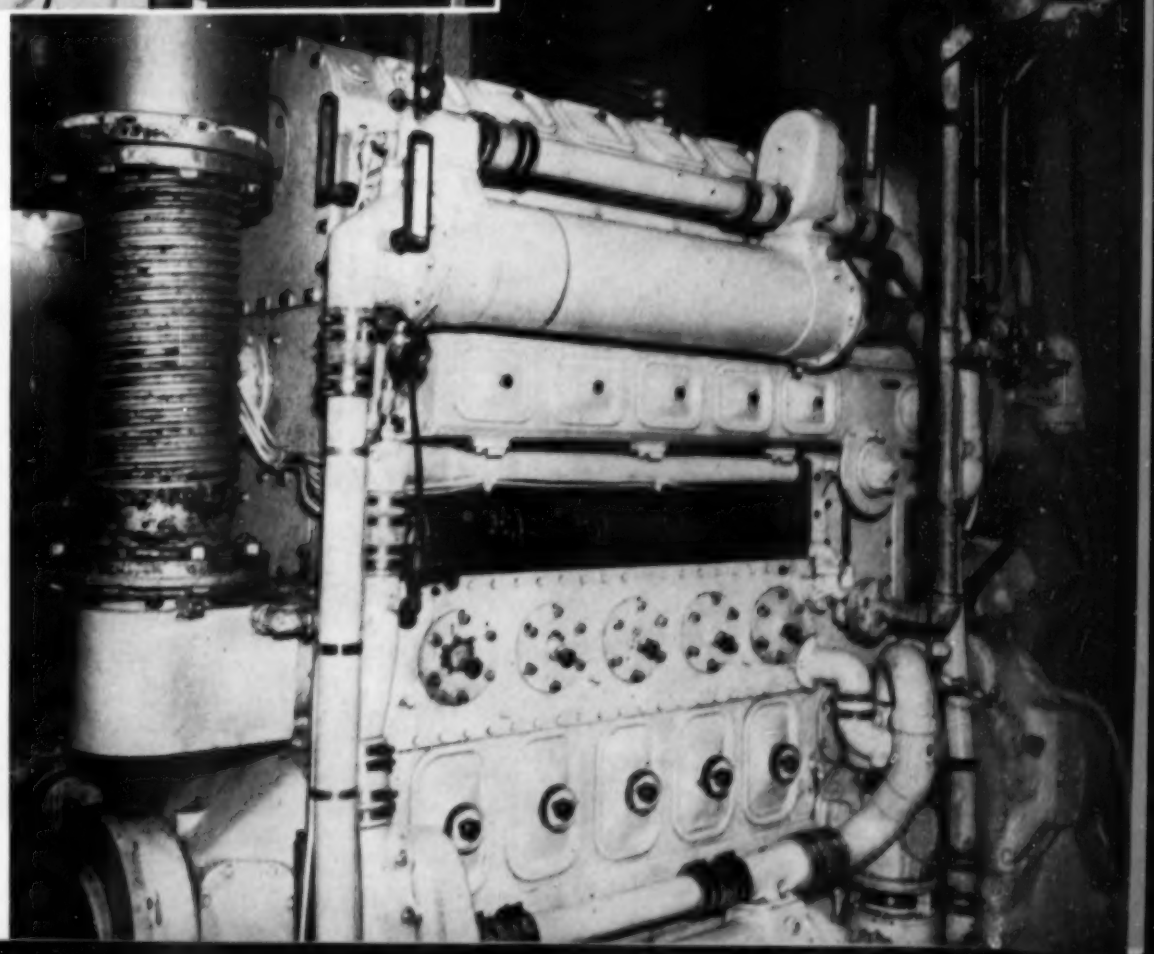
Gauges are provided on lube oil, fuel oil, raw water, jacket water and starting air pressure, with visual and audible alarms on jacket water and lube oil pressure and temperature. Exhaust gases are expelled through a vertical snubber erected in the vessel's stack, just aft of the pilothouse.

In addition to the *Lucy*, the Boston Fuel Transportation Co. maintains four other self-propelled tankers at Boston, ranging in capacity from 4000 to 14,000 barrels each. Two towboats and five barges round out the fleet. The favorite, however, is the *Lucy*. According to Thomas Warren, port engineer for Boston Fuel, this busy little tanker and her crew have set records in meeting urgent delivery schedules. Bert Reinauer, president, Reinauer Transportation Companies and its subsidiary, the Boston Fuel Transportation Co., is the man chiefly responsible for the *Lucy's* successful repowering project. A large part of the credit for the *Lucy's* success also belongs to Captain Vincent D. Tibbetts, vice president and general manager of Boston Fuel, and to Mr. Warren, the port engineer. The *Lucy's* captain is D. C. Wickens; F. E. Hall is the mate, and Bernard Nickerson is chief engineer.

List of Equipment

Main engine—Fairbanks-Morse Model 38F5¼, 2-cycle, 5-cylinder, 5¼x7¼ in., opposed-piston marine diesel engine rated 375 hp at 1200 rpm.
Governor—Woodward.
Fuel oil strainers—Fram.
Duplex fuel oil filter—Purolator.
Fuel oil transfer pump—Tuthill.
Lube oil strainer—Air-Maze.
Lube oil by-pass filter—Purolator.
Lube oil cooler—Kewanee-Ross.
Heat exchanger—Kewanee-Ross.
Air-intake filter—Burgess-Manning.
Starting air compressor—Quincy.
General service pump—Viking.
Main cargo pumps—Viking.
Tachometer—Weston.
Exhaust snubber—Burgess-Manning.
Switchboard—Weston.
Lube oil—DEE 3D, Socony-Vacuum.

Port view shows engine-mounted Ross lube oil cooler and heat exchanger. A Weston tachometer is used, and both the air intake filter and the exhaust snubber are Burgess-Manning.



No lands lay idle on Stahmann Farms. Cotton is planted between rows of trees in the orchard. About 1000 acres are used in this manner.

DIESELS PUMP WATER FOR PECANS, COTTON AND GEESE

A battery of diesel-driven pumps—providing water for the irrigation of 4000 acres of arid lands in the Rio Grande Valley near Las Cruces, New Mexico—has helped an organization known as Stahmann Farms, Inc. become one of the largest growers of pecans in the world. The farm produced a crop of almost three and one half million pounds of pecans in 1954. By making full use of its irrigated acres the farm also produced a crop of cotton equal to the average yield of a 1000 acres. In addition 200,000 geese were marketed.

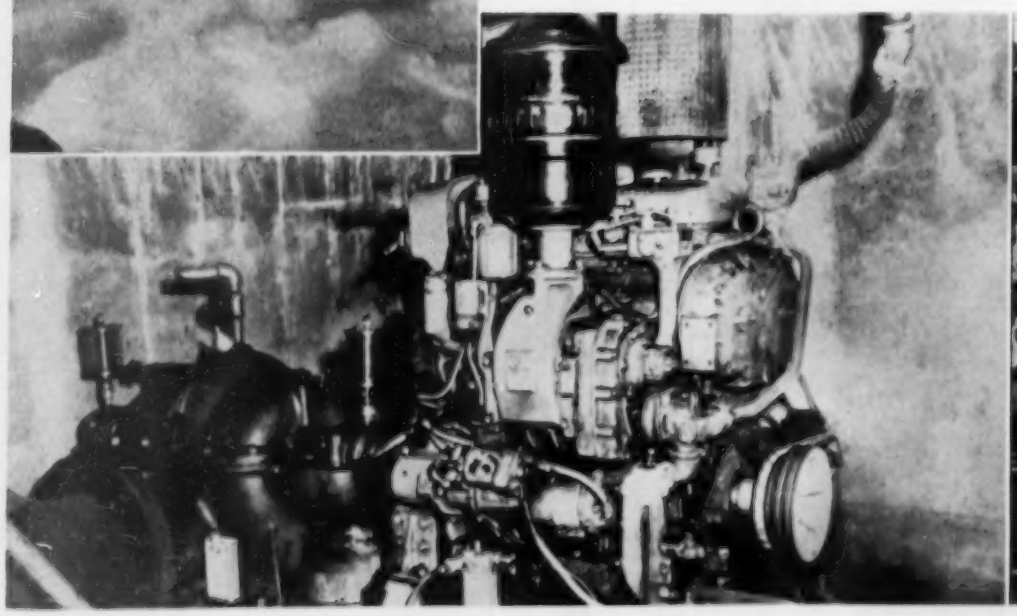
The cotton is planted to utilize space between rows of trees, ditches provide an ideal environment for the geese. Alfalfa is raised to provide supplementary feed for the geese, but all other products raised on the farm are processed for the ultimate consumer. Pecans are shelled and packaged. Cotton is ginned and baled. Eggs laid by the flocks are hatched and goslings reaching the age of 16 weeks are processed and frozen. Cotton seed is sold to other farmers for planting. The farm provides work for approximately 400 regular employes. They are engaged in working the land, operating shelling and packaging plants, a cotton gin, freezing plant, garages, machine shops, goose processing plant, commissary, and manning the offices.

The irrigation system which makes this big operation possible consists of 15 pumping units, all powered by General Motors two-cycle diesels. Some of these units pump from as many as four wells. The water flows through irrigation ditches by gravity. Pumps are operated 24 hours a day, eight months out of the year. They deliver water at the rate of 2500 gph each. John D. Chandley, Stahmann Farms' spokesman, attributes the success of this venture to management's ability to approach maximum productivity of the irrigated acres, plus their ability to get pumping costs down to a minimum. When a system of this scope must be kept in use over most of the year, such costs are an important factor in determining an operation's success or failure, he said. "After all," Mr. Chandley continued, "we are competing with farmers who get all the water they need without expense as rainfall. We don't expect to get water here that cheap, but fortunately the economy and dependability of diesels has helped us make very satisfactory progress in this direction."

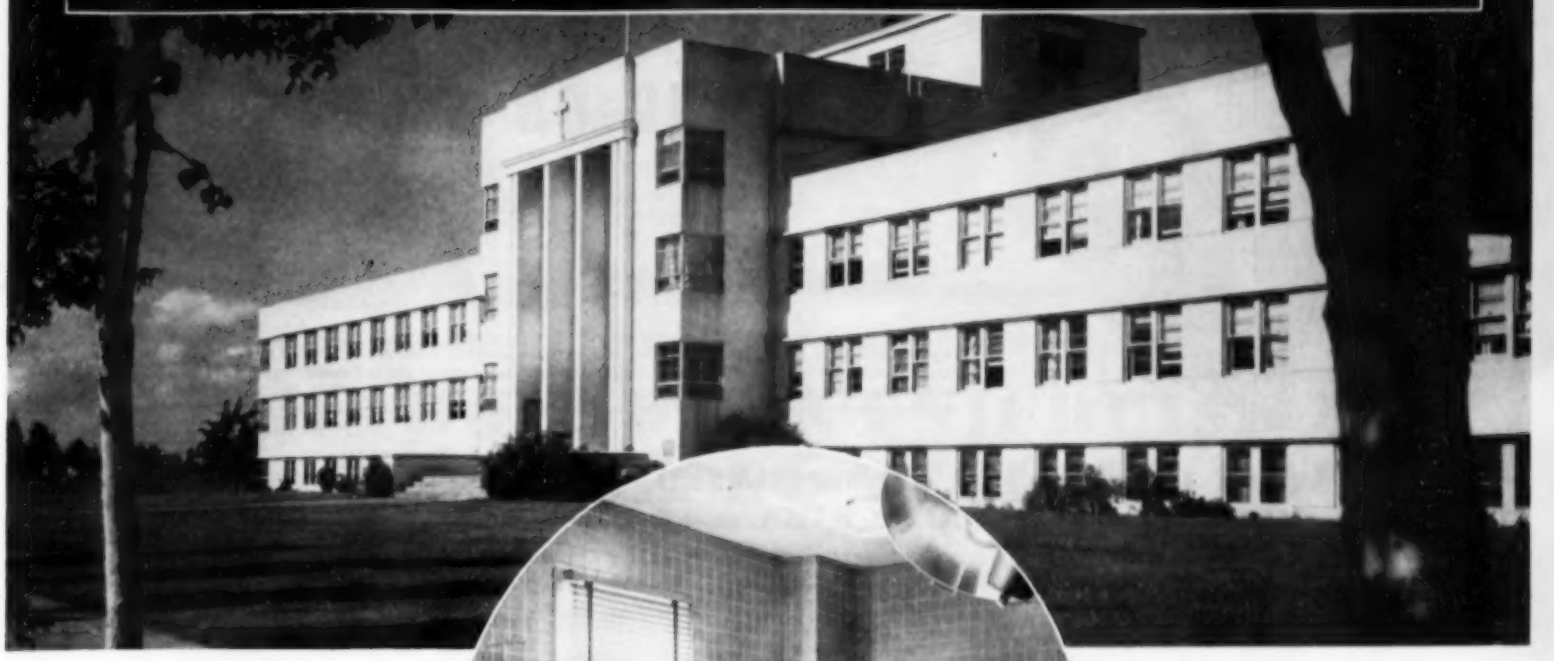
Water is pumped into irrigation ditches at the rate of 2500 gallons per minute per pump. Fifteen pumping units, all dieselized, operate 24 hours a day for 8 months of the year.

One of the battery of dieselized pumps. This unit is located in an underground concrete room. GM 2-cycle diesels are used.

Even the irrigation ditches play a dual role. They also provide an ideal environment for raising thousands of geese.



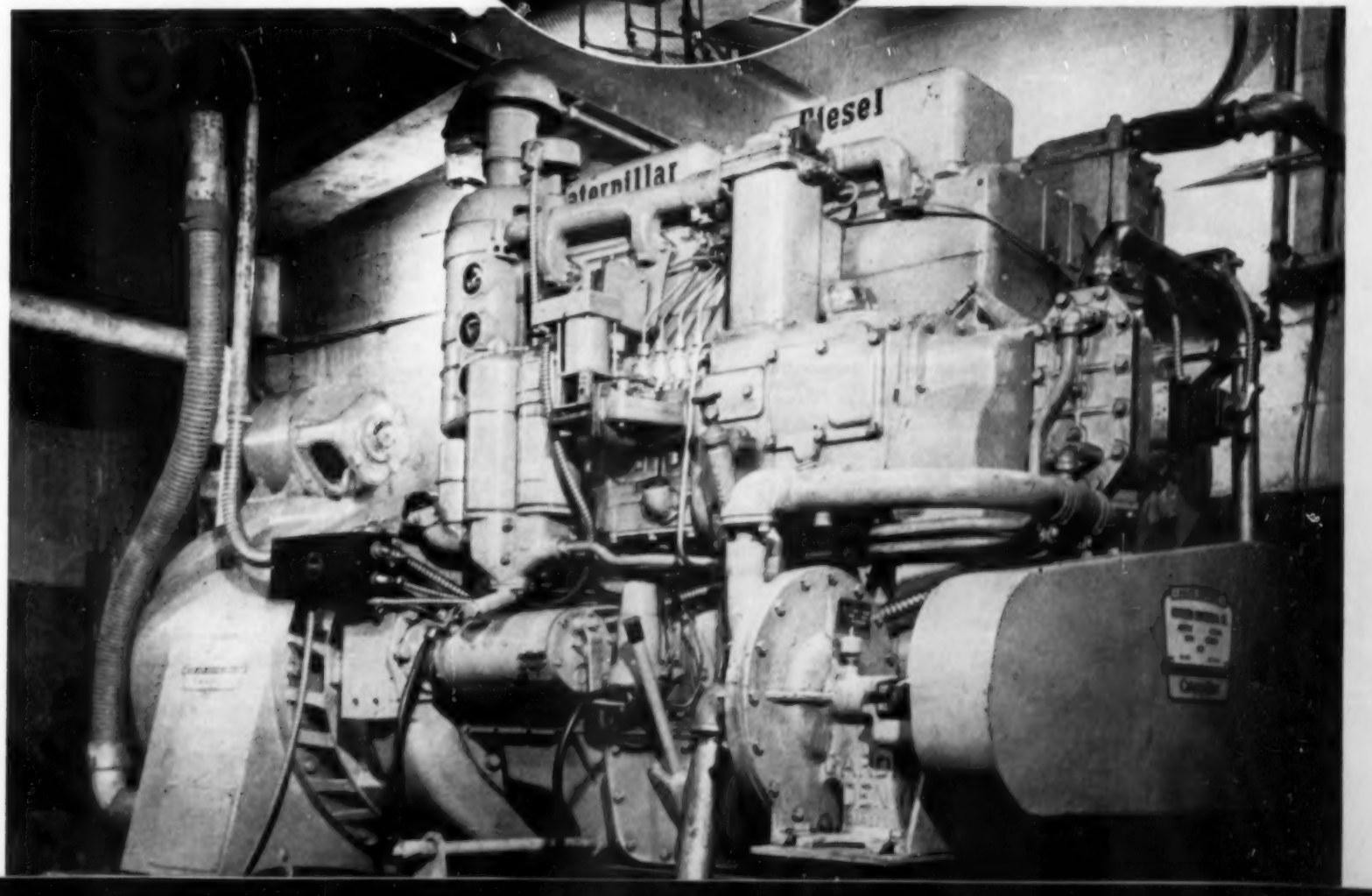
A CIVIL DEFENSE INSTALLATION



A hospital is not considered modern in this atomic age if it lacks a standby diesel generator set. Providence Hospital, Anchorage, Alaska, not only is modern in appearance, but also in its provision for possible commercial power failure.

This Caterpillar D8800 diesel-electric set protects patients in the Anchorage hospital. It switches on immediately if normal current is interrupted by disaster.

Surgery in itself is enough of an emergency to worry a sick person. There is no need to worry about the emergency being compounded in this Anchorage operating room due to failure of electricity. The standby diesel generator set in the hospital's basement guards against such contingencies. Hundreds of other operating rooms such as this have similar protection, and more hospitals are making diesel standby installations every year.



WHAT'S GOING ON IN ENGLAND

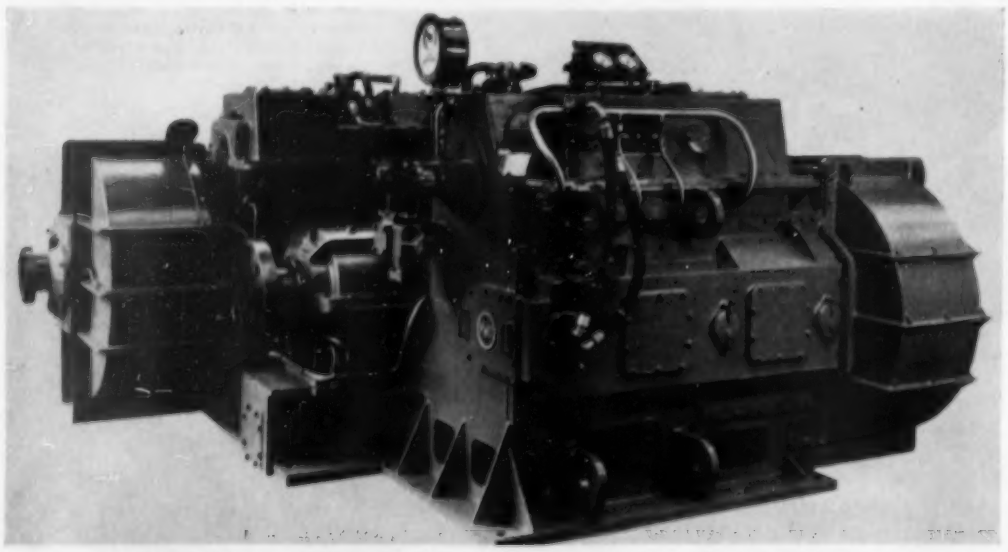
CONDUCTED BY **HAMISH FERGUSON**

Hamish Ferguson received his training and early experience with the English Electric Company. Subsequently, he spent a number of years with a firm of diesel engine consultants, London, and in 1944 became secretary to the Diesel Engine Users Association. In 1953, he relinquished his appointment to devote his time to private consulting work connected with diesels and gas turbines.

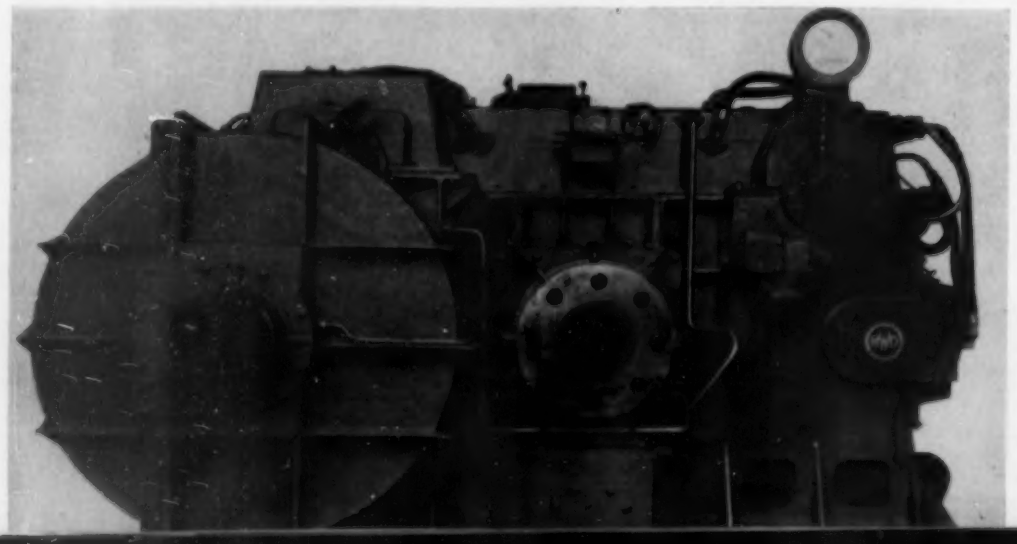
CANADIAN FERRY WITH OIL-OPERATED REVERSE-REDUCTION GEARS

THE new 12,000-hp Canadian ship, *Bluenose*, built by the Davie Shipbuilding Company at Lauzon, Quebec, is equipped with British-built transmissions supplied by Modern Wheel Drive Limited of Chesham and Slough, Bucks. The vessel will be commissioned as a vehicle and passenger ferry, operating between Yarmouth, Nova Scotia and Bar Harbor, Maine. This is approximately a one-day journey across the wide entrance to Fundy Bay. This service will open up the hitherto inaccessible sporting and touring terrain of Nova Scotia to dwellers on the Eastern Seaboard of the United States and Canada, the terminal at Bar Harbor being within reasonable access of New York, Boston and adjacent cities.

The ship's machinery represents examples of multi-engine propulsion with reverse-reduction gear boxes driving twin screws. There are two sets of three Fairbanks-Morse engines driving twin-screws through the two Hindmarch/MWD oil-operated reverse-reduction transmissions. Some of the advantages of this method of propulsion can be appreciated by comparing it with direct-coupled slow-speed reversing diesel engines for a similar duty.



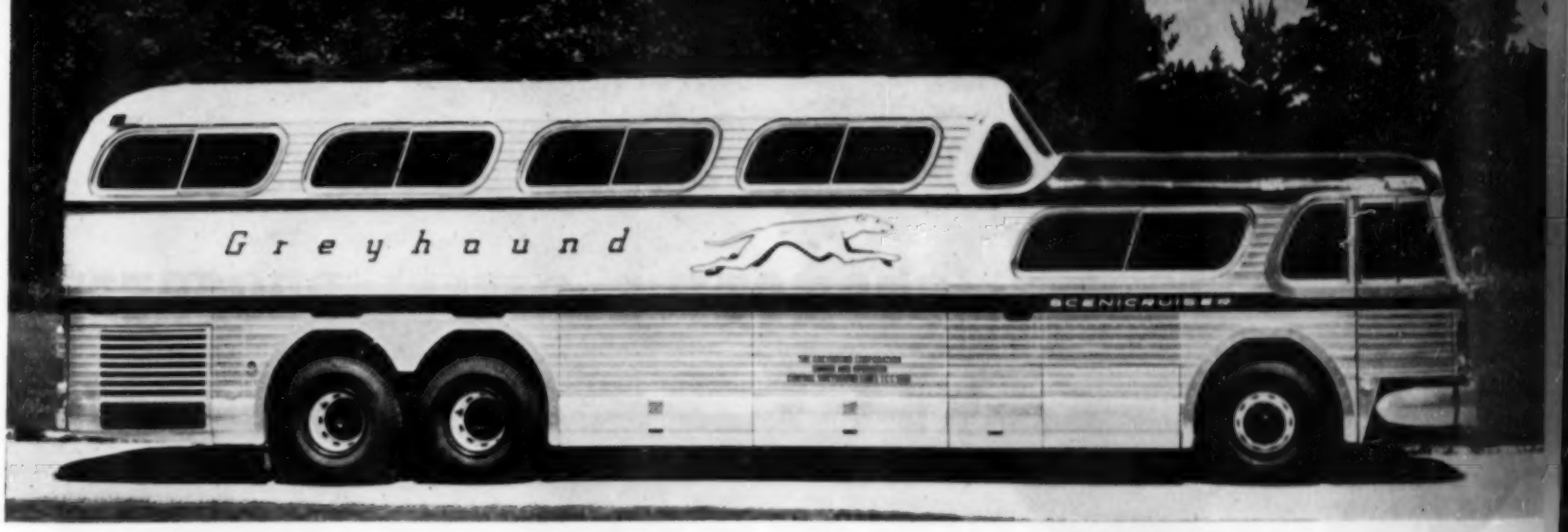
Hindmarch/MWD three-engine oil-operated reverse-reduction main propulsion gear, type 3MWR size 6. One of the two for the ferry *Bluenose*. Each gear transmits 6000 hp, that is 2000 hp per engine, at 750 rpm. Propeller speed is 200 rpm.



Direct coupled, slow-speed engines in passenger service present difficulties to the naval architect since the engines are bulky and need be located amidships. They use up a substantial amount of the internal space needed for vehicles and passengers. Such engines occupy the entire depth of the ship from keel to top deck, thereby creating a considerable obstruction and necessitating the accomodation for vehicles and passengers being arranged around the engine trunk. This is avoided in the *Bluenose*, because of the exploitation of multi-engine drives,—in this instance six engines, three coupled to each gear box.

The engines are coupled individually and collectively to the final drive through isolating clutches and reverse-reduction gearing to give a propeller speed of 200 rpm corresponding to engines speeds of 750 rpm. These engines collectively are much smaller in size than the equivalent hp in slow-speed reversible engines, and, since their height is low, they can be accommodated within one deck.

The two Hindmarch/MWD gear boxes each transmit 6000 hp. The engine arrangement provides for two engines forward and one engine aft of each of the gear boxes. The port and starboard transmissions are arranged side-by-side with the two after engines located on the outside of the twin propeller shafts. The engines and gear boxes are optionally controlled directly from the bridge. Each gear box takes the power of three 2000-hp Fairbanks-Morse engines. The reduction ratio is 3.75-to-1 and the power astern is the same as the power ahead. The gear boxes are approximately 15 ft. in length and width by 9 ft. high. The controls consist of a main lever which gives forward, stop and astern on the whole transmission, while three smaller levers isolate or engage the three engines individually. The ship is propelled by a maximum of six engines, any one or more of which can be disconnected at will. When operating a regular schedule in water where there is a strong variable tidal current, some of the engines can be disconnected during the run in the fair tide and all the engines can be brought in together in order to overcome the foul tide and so adhere to the timetable despite tidal conditions.



GREYHOUND'S SCENICRUISERS USE TWO DIESEL ENGINES EACH

By M. O. WAUGH

ALTHOUGH Greyhound buses, in the past, have been diesel engine equipped, the most important mechanical innovation in the design of the new Greyhound Scenicruiser is said to be the use of a "power pack" consisting of two 4-cylinder GM diesel engines in each bus. They are 150 hp engines and are mounted side-by-side at the rear of the bus. They drive the coach through two fluid couplings connected with a multiple-speed transmission. The engines also operate the generator and air compressors.

Information from the Greyhound office in Washington, D.C., explains that: "a power take-off from the right engine operates the air-conditioning system; and if either engine should fail, manual operation of the fluid couplings by the driver permits the other engine to propel the bus and run the accessories. The fluid coupling also permits one engine to operate the air-conditioning unit at idling speed when the bus is parked at terminals. An important feature is the mounting of these twin engines as a unit, so they can be removed and replaced by another dual engine assembly with minimum time loss. Thus the bus can be kept in service while engines are being repaired or rebuilt."

Further details include the facts that the new Scenicruisers ride "on air" instead of on metal leaf-springs. In other words, the body of the bus "floats on cushions of compressed air contained in 12 flexible rubber-nylon bellows, two over each wheel.

The coach body is held constantly level on curves, despite variation in the load distribution, because automatic valves control the air pressure. The new long wheel base design and tandem rear axles make for riding ease. The differential is on the forward one of the tandem axles, for driving power, while the rear axle rides free to absorb road shock more effectively. All four rear wheels carry dual tires, increasing traction for greater safety through power braking. Power steering assures easier and more positive driver control and smoother overall performance of the bus."

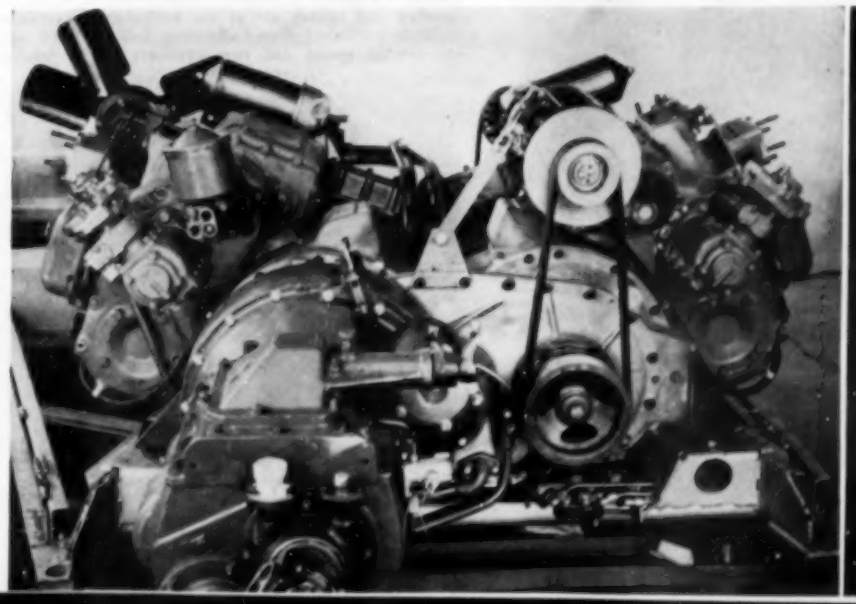
The cost per coach runs about $50,000 each, and as of this writing, there are about 200 such buses in service, and an additional 300 in production.

Fares for travel on the Scenicruisers are no higher than on Greyhound regular buses, except on the New York-Miami and similar "limited" runs, which have always operated on an extra-fare basis. On the Miami-New York run, for example, three express trips leave daily. Pillows and similar services for customer comfort are included in the fares, and the buses of new design allow space for more than the usual amount of baggage.

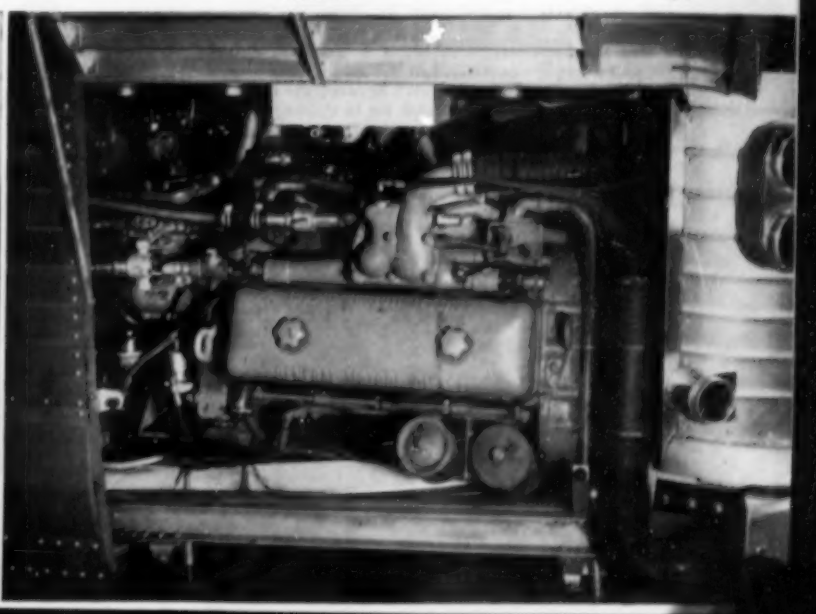
Passengers on the Scenicruisers can ride at either of two levels. An upper deck has space for 33; the lower level accomodates 10 passengers. Glare-resistant safety glass is used in the 6-ft. picture windows along the sides and in the rear observation window of the bus. This gives Scenicruiser travelers maximum visibility to enjoy the scenery. Smoking does not have to be prohibited in the Scenicruisers, because special smoke vents above each seat keep the air clear. The air in the bus is changed every 40 seconds by means of air-conditioning equipment built into the structural design of the bus. The cooled, de-humidified, or heated air comes into the bus at the window ledge level.

Greyhound designers have included diesel engines in the company's buses for many years. The satisfactory performance experienced led them to specify diesels in the new Scenicruisers also.

Twin 4-cylinder GM Detroit Diesels, mounted side-by-side, drive the bus through two fluid couplings. The latter is connected to a multiple-speed transmission. A power take-off on the right engine operates the air-conditioning system.



Should one engine fail, the driver can manually switch to a single engine. Each of the GM engines is rated at 150-hp. Greyhound uses RPM Delo oils in its Scenicruisers.



AUTOMOTIVE DIESEL PROGRESS

A COMMENTARY BY **MERRILL C. HORINE**

Merrill C. Horine, for 38 years a member of the Society of Automotive Engineers, has been actively engaged in automotive engineering, sales promotion and training, advertising and editing of automotive publications since 1907. He has contributed numerous papers on diesel and allied subjects to the SAE and other organizations. An officer in the Air Service in World War I, he was a consultant to the Chief of Ordnance and the Automotive Division of the War Production Board in World War II.

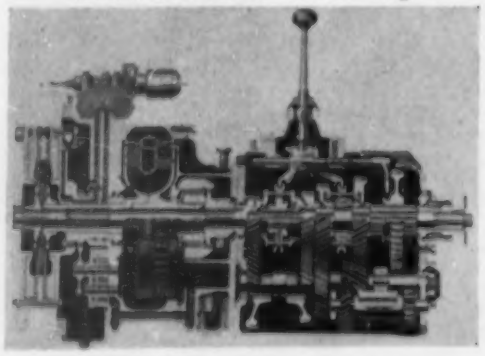
FOR all their comparative lightness, their compactness, and, most important of all, their economy as compared with steam power plants, diesel engines lack one thing to make them ideal for variable loads and speeds. That thing is the flexibility lacking in all piston-type internal combustion engines; but inherent in steam power.

Only by the addition of a means of disconnecting the drive from the engine and of reconnecting it without shock and a means of varying the speed relationships between the engine and the drive—in short of a clutch and transmission or their equivalent—has the internal combustion engine been able to attain it present ascendancy in all fields of power save the very largest.

Automotive applications of diesels have made somewhat severer demands upon the power transmitting elements than other fields of application and than gasoline power plants. This is because the range of variation in load and speed, the frequency with which these changes take place, and the rapidity with which the vehicle is expected to accomodate itself to changes—all exceed demands encountered in other types of service.

Up to the present, of course, the friction clutch and change-gear box has predominated; but of recent times there has been intensified effort to develop other systems to overcome some of the limitations of the conventional drive—to endow the combination of the diesel engine and its drive with operating characteristics equivalent to those of a steam power plant. Currently the hydraulic torque converter is receiving the most attention.

Spicer Synchro-verter, comprising a single-stage transitionary torque converter and five-speed synchro-mesh transmission, with friction clutch between the converter and the transmission for use in shifting.



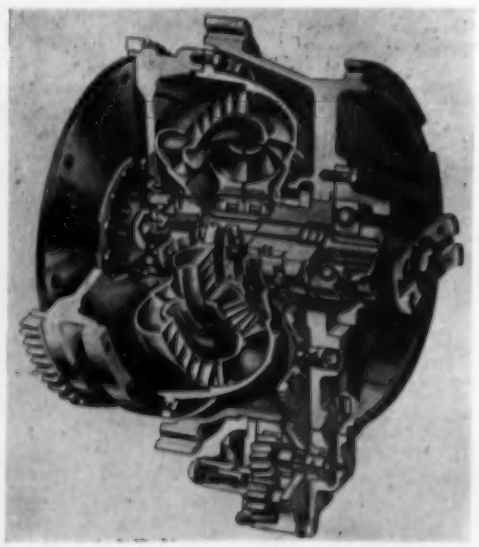
The Torque Converter

First used in mass transit buses, the torque converter was next applied to the huge earth-moving trucks and tractors used in off-highway work. In these applications they are nearly always teamed up with diesel engines. So, also in stationary industrial applications, the diesel and the torque converter have been combined. Applied next to passenger cars, where it bids fair to predominate in a short while, it is now appearing in light trucks and commercial cars—in connection with gasoline engines. Currently, intensive development is in progress of torque converter drives for heavy highway trucks and tractors; a field in which the diesel is fast becoming a preferred power source.

This close association between the diesel engine and torque converter drive is logical from several standpoints. In operations where a great number of gear shifts must be made in a given time, the torque converter offers particular attraction and it is precisely in such applications where the diesel predominates—buses and off-highway trucks. The attraction in this case is the simplification of control which it offers.

Undeniably rougher in operation than gasoline engines, diesels are acceptable in buses when they drive through the cushiony fluid of the torque converter. Perhaps the greatest advantage of all is the torque converter's ability to prevent destructive lugging of diesel engines. By just the extent to which the diesel is able to exceed the gasoline engine in staying power—which is to say sustained torque at low speed—it is vulnerable to greater damage through this kind of abuse.

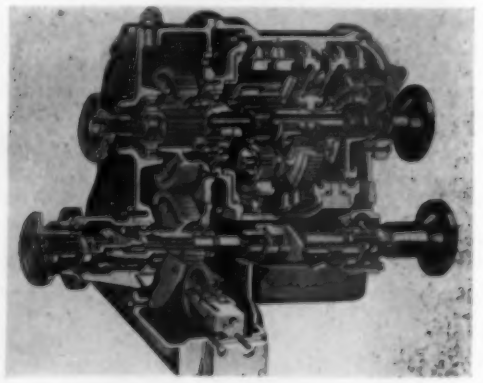
Allison single-stage, four-element transitionary torque converter, cut away to show impeller at left, turbine at right and two stators in middle, with their overrunning clutches.

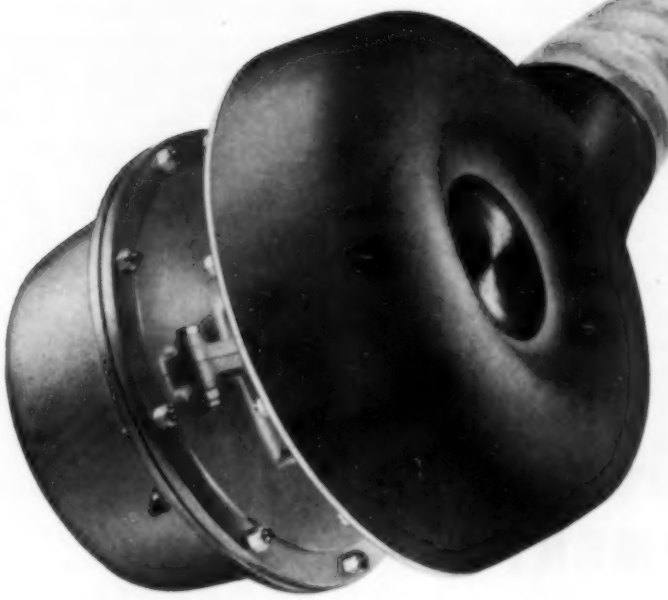


That attention should be centered upon the hydraulic turbine drive,—rather than upon the electric, hydrostatic, fluid coupling, compressed air or any one of numerous mechanical types—is due to the general agreement that it offers the desirable functional characteristics with a degree of lightness, compactness, simplicity and cost advantages beyond any of the others. Among these characteristics are smoothness, cushioning qualities, quietness, flexibility and automatic adaptation to changes in load. Properly designed to match the engine, the load and the nature of the application, the torque converter provides for shockless and rapid acceleration, with the minimum strain on either the engine or the driving parts of the vehicle.

Drivers appreciate that with torque converter drive, the engine is virtually non-stallable and they find this conduces to better traction on slippery surfaces, through slower wheel rotation than is practicable with mechanical drive. Flexibility, by which is meant the ability to cope with a broad range of tractive resistances without recourse to gear-changes, is so pronounced in the torque converters used in mass-transit buses, that their transmissions

Allison Torqmatic planetary transmission, in which all clutches and brakes are of the hydraulically-actuated multiple-disk-in-oil type, affording two forward and one reverse speed and two auxiliary power take-off connections.





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are usually provided with but a single forward speed. Because of its ability to multiply torque within itself, the torque converter enables the engine to pick up the load or to surmount a grade in a ratio one or more steps faster than would be required with a friction clutch or hydraulic coupling and still function normally in such ratio under conditions for which it is appropriate.

Its ability to act in this way, however, has misled many to conclude that the torque converter is adapted to use with transmissions having fewer steps, farther apart or even with no gearbox at all. The absence of such on heavy buses, save for forward and reverse, and the prevalence of two-speed transmissions in connection with passenger-car torque converters, has lent color to this belief. Unfortunately the limitations of the torque converter, as applied to highway trucks and tractors, render it incapable of replacing the transmission or widening the intervals between ratios for equivalent circumstances.

Although three-stage converters in some cases provide as much as 6-to-1 torque multiplication, they do so only at a tremendous sacrifice of speed and consequently at very low efficiency. The converter is not adapted to continuous operation at high slip, which is to say, high torque multiplication. Even in its most favorable range, it is unadapted to continuous running. For this reason it must be provided with some sort of by-pass or lock-out to secure the equivalent of direct drive for the greater part of the time. Those of the multi-stage type usually employ friction and/or jaw clutches for this purpose. Single- and some two-stage types have the stators arranged on an over-running clutch, so that at unity torque, they drift along with the turbines, transforming the unit into a hydraulic coupling of satisfactory efficiency for continuous duty.

As applied to heavy trucks, therefore, the torque converter is not to be considered as part of the transmission; but more properly merely a torque-multiplying clutch, for use in starting and accelerating and at gear shifts. Owing to the small amount of time spent in the lowest gears, however, it is quite practical to use a four-speed main transmission with a torque converter where a five-speed box would be required with conventional drive.

On the other hand, the torque converter emphatically is not equivalent to the compound, auxiliary or two-speed axle in multi-speed arrangements. These compounding ratios are commonly used as regular steps in the progression and for sustained pulling on grades—work for which the converter is not suitable.

If the transmission is to be of the conventional countershaft type, the torque converter may not eliminate the main clutch, which will still be required for shifting, but can be dispensed with if the planetary type of gearing is used. If in addition, the converter is of the transitionary type, acting as a fluid coupling upon attaining unity torque, both the impeller clutch and the direct drive clutch may also be eliminated. Presently transmission arrangements incorporating torque converters are being developed and are now on the market.

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AP 174-715

Young Radiator Company Sponsors 1-Day DEMA Meeting

More than 85 diesel engine manufacturers, University professors, and industrial engineers attended a one-day regional Diesel Engine Manufacturers Association educational meeting recently, at Young Radiator Company, Racine, Wisc. The program began with several conducted tours through the Young main plant to show fabricating, assembly and general manufacturing operations. The tours were concluded in the recently expanding Young research laboratories. Wind tunnels, used for developing heat transfer data on all company products, were demonstrated. In addition, the complete line of Young Radiator Company products for the automotive, diesel, oil field, industrial, heating, cooling and air conditioning fields were displayed.

After luncheon, three papers were presented on various phases of heat transfer by a panel of Young Radiator Company engineers. Subjects were: "Radiators for Small, High-Speed and Heavy-Duty Vehicles," by A. L. Kreul; "Radiators for Stationary Large Horsepower Diesel Applications," by A. D. Bogus; "Shell and Tube Heat Exchangers and Cooling Industrial Hydraulic Circuits," by D. W. Retzinger. In his brief address to the group, Harvey T. Hill, Executive Director of the Diesel Engine Manufacturers Association, thanked the Young Radiator Company for promoting the educational program.

European Diesel News

By Hamish Ferguson

BRITISH RAILWAYS. Details now have been released regarding new equipment to be acquired during the first two years of the British Railways modernization program. Some 50,000 new coaches and wagons will be required, and, on the diesel side, there will be about 1000 multiple-unit railcars, 170 main-line locomotives, and a considerable number of shunters. The main-line locomotives have been designated as Types A, B, & C. The power output of Type A will be from 600 to 800 hp, Type B from 1000 to 1250 hp, and Type C from 2000 hp upwards. For heavy duties, three locomotives of Types A or B will be coupled together to form a multiple unit, and there will be two units using Type C.

MOBILE SPRAYING PLANT. A new type of mobile spraying plant has recently been developed in England by the Shell Petroleum Co. Ltd. and shipped to British Borneo for use in Seria Oilfield. It will use oil-based sprays to control jungle vegetation and insects encroaching on oil pipelines, roads and drilling sites. The spraying plant is installed in a 5-ton vehicle chassis and its most important components consist of an 850-gallon tank, a Villiers 5-hp, 4-stroke engine and heavy pump, and a 45-ft. aluminum telescopic boom carrying hoses fitted with wide-angle jets. In operation, the boom has a total spraying width of 72 ft.

SHELL HYDRODESULPHURISER. The first of its kind to be built in the world, and costing £1,000,000 to erect, the "hydrodesulphuriser," a plant which removes sulphur from petroleum products by the "trickle" technique, has recently come into operation at the Shell Company's oil refinery at Stanlow, Cheshire. Developed by the Royal Dutch/Shell Group's research organization at Amsterdam, the new plant will increase the supply of high quality fuels for diesel engines and farm tractors, and also will make a certain amount of a 100-octane motor spirit component. The "trickle" technique is so named because the oil to be desulphurized is contacted with hydrogen and made to trickle over a special catalyst.

NEW FRENCH DIESELS. The Societe Alsacienne de Constructions Mecaniques, of Mulhouse, has developed a new range of high-speed Vee-type engines with pressure-charging. Operating at 1500 rpm on a 4-cycle system, they have a bore and stroke of 175 by 180 mm. and are made in 8, 12, and 16-cylinder sizes with power outputs ranging from 400 bhp in the 8-cylinder with atmospheric induction up to 1530 bhp in the 16-cylinder pressure-charged model. Both Napier and Brown-Boveri pressure-chargers are employed.

SOLAR MARS GAS TURBINE. A British company, Sugg Solar & Co. Ltd., has been formed to manufacture the Solar Aircraft Company's Mars gas turbine engine in England. The unit to be produced is a small portable plant developing up to 60 hp at approximately 40,000 rpm. It can utilize diesel oil, kerosene, petrol, or natural gas as may prove most economic. The all-up weight is less than 100 lbs.

BLACKSTONE-B. T. H. SHUNTER. Fifteen diesel-electric shunters are being built for British Railways by the British Tompson Houston Co. of Rugby. The main engines are to be supplied by Lister-Blackstone Ltd. of Stamford and are 6-cylinder, vertical, 4-stroke units developing 350 bhp at 750 rpm. The B.T.H. generators are of the six-pole dc type.

FIBRE-GLASS DIESEL LAUNCH. The Ministry of Supply has developed, in co-operation with Saunders-Roe (Anglesey) Ltd., an 18-ft. motor launch for the R.A.F.'s Marine Craft Branch. The hull is made in a reinforced glass-fibre plastic and is claimed to be rot proof. The craft is powered by a Perkins P3 engine and has a speed of 8 knots.

SUPERCHARGED POLAR ENGINES. The first supercharged engine produced by British Polar Engines Ltd., of Glasgow, was demonstrated recently. It is the M47M, single-acting, two-cycle, direct-injection engine and was run under continuous blower supercharge. The engine, normally rated at 1310 bhp at 300 rpm, was able to develop 1750 bhp when pressure-charged at the same running speed. The blower is designed and manufactured by D. Napier & Son Ltd. and the engine is a 7-cylinder direct-reversing marine type.

FILTERS MAY LOOK ALIKE

But ONLY Genuine

Luber-finer PACKS

Give the Results Enjoyed by MILLIONS OF SATISFIED USERS THE WORLD OVER

IT'S WHAT'S INSIDE THAT COUNTS

The Efficiency of LUBER-FINER'S Patented Process HAS NEVER BEEN EQUALLED!

DON'T BE MISLED BY PRICE ALONE!

There is NO substitute for DIESELPAK'S Patented Filtering Process for H. D. Compounded oils AT ANY PRICE. The DIESELPAK cleans more oil faster—keeps it CLEAN longer—and gives more service and better engineered protection than any other filtering element. It PAYS to get the BEST!

✓ PROTECTS ENGINE

The DIESELPAK is designed to remove not only ABRASIVES but also CONTAMINANTS such as moisture, carbon, acid, etc. from oil, and is engineered to keep the filtering media and the removed contaminants from migrating back into engine. The DIESELPAK assures continuous protection that reduces engine wear and maintenance costs far beyond that possible with other types of filter elements.

✓ EXTENDS PERIODS BETWEEN DRAINS

The DIESELPAK collects and holds even the most finely dispersed contaminants without affecting or removing compound additives from the oil. A glance at the dip stick will show that the oil is CLEANER—symbol of better lubrication and longer oil life enjoyed only by Luber-finer users.

✓ TAKES LESS OIL

The DIESELPAK because of its engineered construction requires 2 to 4 quarts less oil than spongy substitute filter elements being offered for use in the Luber-finer housing. This is an additional saving enjoyed when using the DIESELPAK.

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Since Luber-finer was first introduced to the public in 1936, it has gained worldwide acceptance by millions of satisfied users everywhere. Luber-finers are approved by major oil companies and petroleum engineers. Luber-finers are standard or optional equipment on America's foremost stationary engines, diesel trucks, tractors and earth-moving machinery.

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BIG NEWS

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FRAM completely removes water from diesel fuel with NEW WATER SEPARATOR & FUEL FILTER

✓100% Water Removal! ✓Traps Dirt and Dust!
✓Cuts injector maintenance costs!
✓Reduces down-time!

The new FRAM Water Separator & Fuel Filter is a double-action filter for complete injection system protection—

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Save the cost of replacing expensive injectors! Guard your diesels for longer life . . . less wear . . . fewer repairs—with the new FRAM Water Separator & Fuel Filter! For specific installation information write: FRAM CORPORATION, Providence 16, R. I. Fram Canada Ltd., Stratford, Ont.

IMPORTANT!
Diesels already equipped with FRAM Fuel Filter need only the Water Separator Filter and a new FRAM Coalescer Cartridge for 100% water removal!

FRAM
OIL • AIR • FUEL • WATER
FILTERS

Gulf Coast Diesel Notes

By Michael T. Pate

McWILLIAMS DREDGING CO., New Orleans, La., has bought from Stewart & Stevenson Services, Inc., Houston, a Series 110, General Motors 260-hp diesel, equipped with 4.5:1 hydraulic reversing and reduction gear. It will be used to power a new tugboat, the *Queen*.

D. H. & S. C. McHAM, HOUMA, La., have bought, through Big 3 Welding Equipment Co., Houston, three Model S-7068D Lincoln 300-amp welding machines, each powered by a General Motors diesel.

BURKBURNETT, Texas, has bought from Fairbanks, Morse & Co., a Model 38D8-⅛ 960-hp spark-ignited engine to be installed in the city light plant.

HANSON TOWING CO., Galveston, has bought, through Buda Engine & Equipment Co., Inc., Houston, a 5-kw Onan dc generating set which will be used for tug lighting service.

PORT IRON & SUPPLY CO., Port Arthur, Texas, has bought from Stewart & Stevenson Services, Inc., a Model 3030 General Motors diesel equipped with a 1.76:1 speed reducer which will be used for a Northwest Model 105 dragline.

EMSCO MANUFACTURING CO., Houston, has secured from Waukesha Sales & Service, Inc., Houston, two Model 6LRDBU Waukesha diesels, each rated 375 hp at 1200 rpm. The diesels will be used to power a drilling rig.

GULF REFINING CO., Southern Pipeline Division, Houston, has bought a General Motors Model 4078 inclined diesel marine propulsion engine equipped with 1.5:1 hydraulic reversing and reduction gear, which will be used to power a 29-ft. Chriscraft, the *Melda*.

MIER RIG & CONSTRUCTION CO. Houston, has bought, through Whites, Inc., Houston, a Model UD 1091 International Harvester diesel rated at 180 hp, to power a generator drive.

PHILLIPS PETROLEUM CO., Bartlesville, Okla., has bought a Fairbanks-Morse Model 45, 10½ hp diesel generating set rated at 6 kw.

OFFSHORE PACKING CO., Brownsville, Texas has bought a Stewart & Stevenson Model 2MD20 ac generating set powered by a Series 71 General Motors diesel. Rated output of the set is 20 kw.

MAGNOLIA PETROLEUM CO., Dallas, has bought, through Big 3 Welding Equipment Co. a type S-9660 250-amp Lincoln welding generator, powered by a Hercules Model DIX4D diesel, rated 36 hp at 1600 rpm.

MALLARD & MALLARD, construction contractor of Liberty, Texas, has bought from Whites, Inc., Houston, a Model UD 1091, 180-hp International diesel, driving a centrifugal pump.

PHILLIPS PETROLEUM CO., Bartlesville, Okla., has bought three Stewart & Stevenson generating sets, each powered by a General Motors 110 diesel, to deliver 130 kw, and, from the same source, two 8-567-C Electro-Motive diesel-driven generating sets rated 875 hp each, for dc electric rig drive.

RONALD LEE, Seabrook, Texas, has purchased, through Buda Engine & Equipment Company, Inc., Houston, a 7½-kw Buda battery charging set which will be installed on his boat *Ebbtide*, being built by Seabrook Shipyard.

HOUSTON CONTRACTING CO., Alexander City, Alabama, has bought from Big 3 Welding Equipment Company, Houston, two 250-amp Lincoln welding generator sets, each powered by a Hercules diesel, model DIX4D. The units will be used on pipeline construction work.

DIESEL SERVICE CO., Houston, has bought from Waukesha Sales & Service, Inc., a Model 180DLC Waukesha diesel rated 38 hp at 2000 rpm. The engine is destined for marine propulsion service.

EDWARDS TRANSPORTATION CO., Houston, has bought from Fairbanks-Morse two Model 45, 6-kw diesel generating sets, each powered by a 10½ hp F-M diesel.

NATIONAL SUPPLY CO., Houston, has bought through Stewart & Stevenson Services, Inc., two 600-hp General Motors quad diesels, series 6-71, which will be used for oilfield drilling rig power.

HUNT TOOL CO., Houston, from Big 3 Welding Equipment, a 300-amp Lincoln welding generator powered by a General Motors diesel, which will be used in shop welding service.

LEE DICK, Galveston, will power his wooden shrimp boat with a General Motors Model 6071-A 165-hp diesel, driving through a 2:1 hydraulic reversing and reduction gear. The 45-ft. craft will be used for offshore shrimping.

NATIONAL SUPPLY CO., Houston, has bought through Waukesha Sales & Service, Inc., Houston, a Model 135 DKU Waukesha diesel, rated at 106 hp. The diesel will be exported for service in Canada.

Inland River Reports

By A. D. Burroughs

WE WERE pleased to get a glimpse of the new gleaming white *Kansas City* on her maiden voyage as she passed St. Louis. Owned by Sioux City and New Orleans Barge Lines, built by Parker Brothers, her two 1600 hp Model 278 G-M (Cleveland) diesel engines were giving good power for her 4000-ton tow of molasses.

REPORTEDLY the largest and most powerful new towboat, *Lachlan Macleay*, is now in active duty for Federal Barge Lines. Built by St. Louis Ship, she is equipped with four GM 567 diesels for a total 3600 hp. She is named for the late Lachlan Macleay, past president of the MVA.

MARY B, another popular Missouri River boat is now rated at 3200 hp. Formerly equipped with two 6 cyl. Fairbanks-Morse engines totalling 1380 hp., *Mary B* is now repowered with two Model 38 Fairbanks-Morse OP diesel engines. She was formerly the *Twin-Cities*.

THE MISSISSIPPI River had its hottest cargo recently—5,000 tons of hot liquid sulphur. The *H.F. DeBardeleben III*, owned by Coyle Lines, handled the tow for the 1100-mile trip from Port Sulphur, La. to St. Louis. She gets her power (2000 hp.) from Chicago Pneumatic diesel engines.

OVER ON the Ohio, the *T. G. Gerow*, the Ohio River Company boat, looked mighty fine upward bound with coal barges. Equipped with Superior Model 80-M-8 diesels totaling 1600 hp, she was originally named the *National* when owned by American Barge Lines.

COAL TRADE was heavy on the Ohio with the *Mike Creditor* active. Built by St. Louis Ship last year, this boat was getting good power from her Baldwin-Lima-Hamilton 6 cyl. supercharged diesels giving a total of 2120 hp.

AN OLDTIMER, *John J. Hoopes*, was also busy in the coal trade. Built in 1929 at Dubuque, Iowa she was originally a steamer. Now working for Crain Bros., she was equipped with Fairbanks-Morse diesels for a total 400 hp around 1945.

ANOTHER old faithful, *Smoky City*, was down bound with two barges of pipe and a cargo barge. Owned by Glenn Crain, she was equipped with Caterpillar 8 cyl. 5¾x8 diesels for 215 hp in 1950.

AT PITTSBURGH, the *Buckeye* was back in the coal trade. Owned by Keystone Division, Dravo Corporation, this ten year old boat still gets steady power for active service from her Cooper-Bessemer JS-6 diesels for a total of 760 hp at 310 rpm.

POWERED BY Busch-Sulzer 6 cyl. diesels giving a total 1200 hp at 300 rpm., the *Bayou Barataria* was up bound with three gasoline barges. It was our first time to see this Oil Transport Company's boat in action and she looks as good as her dependable performance.

ALSO UPBOUND with 12 barges was MVB's faithful *Central*. This boat is seen as regularly as the sun and was making even better time than her rated 2000 hp from her Enterprise 8 cyl. 16x20 diesels.

AT WHEELING, we watched the *George G.* doing a neat job with a tow of sand and gravel. Powered with Cummins diesels rated at 400 hp., she is owned by Ohio River Sand & Gravel Corp.

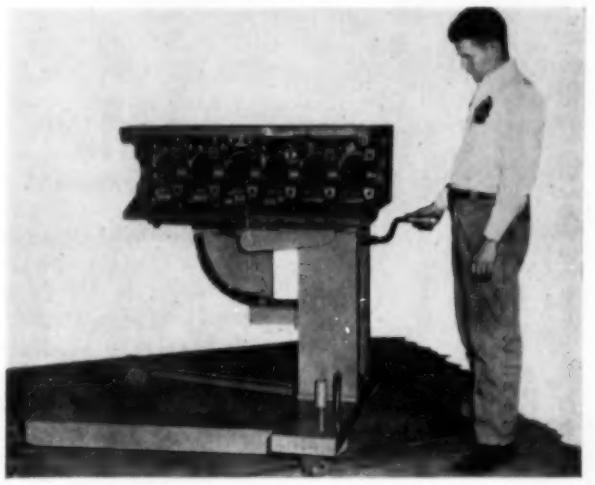
WE FINALLY caught up with an old favorite, the *Sara* as she was up bound with oil and gasoline. Nelseco 6 cyl. diesels provide 350 hp for this boat first out in 1937.

A RARE VISITOR in these waters seen recently was the *Bull Durham* with a couple of loads of petroleum products. A top looker and performer in any book, it is equipped with Caterpillar diesels totaling 1200 hp. Owned by Bull Towing Co., this boat was built by Nashville Bridge Co. in 1951.

A NUMBER of complimentary reports came in on the performance of the *Omaha* as she brought in the initial appearance of oil field and pipe cargo on the Missouri. This Sioux City and New Orleans boat built in 1953 was making better time than her rated 1800 hp from G-M 5-67 diesels according to all reports.

AN EXCELLENT bit of river photography was sent in by Mr. Fred Merta. A shadow shot of Federal Barge's *Inwaco* made a beauty of a picture of a beauty of a boat. *Inwaco's* odd name was obtained in a contest and incorporates syllables of Inland Waterways Corp., her original owner. She gets truly dependable power as shown by her work record from two 900 hp. Supairthermal Nordberg diesels.

New Engine Stand Permits Lower Working Position
No Platform Needed



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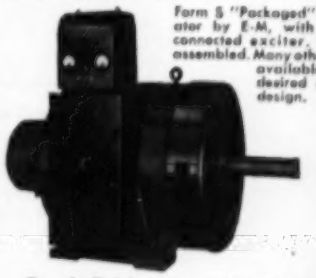
"ON-THE-SPOT" POWER WHEN YOU NEED IT

These "vest pocket" auxiliary power plants are operated by a large refining company. Such plants, comprising a diesel engine and a 100 kw E-M "Packaged" Generator, produce high-quality voltage right on the spot, for needs such as lighting, controls, communications, and even large pump motor starting and operation.

E-M "Packaged" Generators supply constant voltage automatically... dependably

● Simple, trouble-free, and dependable ... these E-M "packaged" units are *complete*. Generator, exciter, control, and all necessary components are integrated into one compact housing, ready to install and easy to connect. And no special switchboards or operating skills required!

Built-in voltage regulators assure a steady output whether generators are operated singly or in parallel. When load varies, voltage output is quickly returned to desired level.



Form S "Packaged" Generator by E-M, with direct-connected exciter. Factory assembled. Many other types available to fit desired engine design.

Sturdy E-M construction plus a minimum of moving parts gives you long service with only routine maintenance. Ratings to 187 kva, in speeds of 900 to 1800 rpm. Ask your nearest E-M sales engineer for more facts, and write for publications listed below.

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☐ "The A-B-C's of 'Packaged' Generators"
☐ E-M Synchronizer No. 35, Generator Issue (2100-TPA-2147)

Mid-Continent Diesel News

By Jack F. Cozier

ALEXANDER DISTRIBUTING Co., Pearland, Tex., has purchased an IH L-190 truck with a four-cylinder P & H 487-C-18 diesel engine. This is the initial installation of such an engine in Texas. The unit, sold by Diesel Engine & Equipment Co., Houston, has a Roosa Master injection system. The truck will be used to haul bananas from Galveston to Detroit with a return load of tile.

TEXAS PIPE LINE CO., Salem, Ill., purchased a Buda HP-217 gas engine for oil production pumping from Arrow Engine Sales & Service, Inc., St. Louis, Mo.

DIESEL EQUIPMENT CO., Wichita, Kan., held open house June 18 at their new branch office at 1802 Kansas Ave., Great Bend, Kan. E. J. Stecklein, new branch manager, said this expansion doubles their capacity in Great Bend.

NATIONAL SUPPLY CO., Tulsa., purchased a Buda 8MO-1290 gas engine for sale to Mesker Drilling Co., Tulsa., for powering a mud pump. The sale was made through Buda Engine & Equipment Co., Tulsa.

THE CITY OF AUGUSTA, Kansas, recently completed overhaul of the municipal light plant Cooper-Bessemer LS8-GDT power unit. The engine had a 33,250 bhp/per/gal. average for three years operation and 25,457 hours of use. It used 1130 gal. of lube oil, Socony-Vacuum DTE No. 4D.

DALLAS RAILWAY & TERMINAL CO., had a parade in Dallas recently to show off 30 new Southern buses powered by Cummins NHHB-600 pancake-type engines.

FRANCIS BEARD DRILLING CO., Mt. Carmel, Ill., has repowered a Bucyrus-Erie oil well spudder with a Buda K428 gas-gasoline engine sold by Arrow Engine Sales and Service, Inc., of St. Louis, Missouri.

FORTIER & WRIGHT DRILLING CO., Wichita, has acquired a second Murphy diesel, a Model 422, powering a Bethlehem S-50 drawworks. The mud pump on this "split" rig is powered with a Murphy Model 20 diesel. The rig is active in Cowley county, Kansas.

GRAHAM-HOEME PLOW CO., Inc., Amarillo, operates seven Autocar trucks powered by Cummins diesel engines.

ELMER HEDRICK, Caldwell, Kan., converted a Case LA tractor to a GM 3-71 diesel engine. The tractor is used in general farm work. The sale was made by Diesel Equipment Co., Wichita.

BELL ENGINE SERVICE, Great Bend, Kan., recently bought eight 6MO-970 Budas, four 6MO-893 Budas, and four 8MO-1290 Budas. The gas units were sold by Buda Engine & Equipment Co., Tulsa., and will be used for irrigation work in Kansas.

PLATZER BOAT WORKS, Houston, recently completed an all-steel 30-ft. crew boat for off-shore work, powered by a P & H 687-C-18 marine diesel. The 205-hp unit was sold by Diesel Engine & Equipment Service Co., Houston.

WATSON DRILLING CO., Winfield, Kan., replaced their rotary rig power with a twin GM 6-71 diesel unit. The sale was made by Diesel Equipment Co., Wichita.

HAZELL MACHINE CO., St. Louis, Mo., installed six DA-779 and one 6 DAS-779 Buda diesels in Roto-Master seed bed preparation farm machines. The units are for export shipment to Cuba and Puerto Rico.

new! ADVANCED ENGINEERING FEATURES

new! EXTRA-HIGH FLOW RATES

new! QUICK-OPENING LIDS

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A COMPLETE NEW LINE
of HONAN-CRANE
OIL FILTERS
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"F" type Full Flow
Designed for in-line installation at extremely high flow rates—25 to 800 GPM. Features low pressure drop—only 4 PSI across unit at 170 SUS. Uses new "FLO-PAC" pleated paper cartridge, removes particles down to one micron.

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For applications where oil must be kept absolutely clean . . . bulk Cranite medium provides depth purification. Bulk or cartridge type cellulose refills are available for fine filtering . . . permitting "custom" filtration.

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Available in eleven sizes with six different types of cartridge filter elements to give exact degree of filtration needed. New "FLO-PAC" and "KLEER-PAC" cartridges feature exceptionally high efficiency—large dirt holding capacity.

All models have new Quick-Opening Lids
Purifier lid is fastened with swing bolts which one man can loosen quickly. Lid swings back for easy access to refills.

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HOUDAILLE-HERSHEY OF INDIANA, INC.
FILTRATION DIVISION
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FRANK L. THOMAS, INC., Dallas, a truck fleet owner, operates eight Autocars and seven Kenworths, all powered by Cummins diesel engines.

W. B. CARTER CONSTRUCTION CO., Wichita, has repowered a Barber-Greene ditcher with a 3-71 GM diesel. The repower was sold by Diesel Equipment Co., Wichita, and the ditcher will be used for sewage construction work.

JENNINGS ENGINE SUPPLY CO., Oklahoma City, purchased a 6MO-672 Buda gas engine for resale in oil well pumping service in Southern Oklahoma. The sale was made by Buda Engine & Equipment Co., Tulsa.

UNIT RIG & EQUIPMENT CO., Tulsa, announced recently the first trailer mounted U-15 drawworks with the power being supplied by four NH Cummins diesels. The trailer was developed for export. The first was sold to Loffland Brothers Company, Venezuela, by Mid-Continent-Cummins Export Corp.

Now Going Into The Mails

The latest and most complete edition of DIESEL ENGINE CATALOG, Volume 20, started going into the mails on June 15th, filling advance orders for the publication. Orders for the volume are being filled as rapidly as possible.

A number of valuable features have contributed to DIESEL ENGINE CATALOG's acceptance as the dependable and accurate diesel reference source in the industry. The engine section describes the major products of the important manufacturers in the field. The accessory section details the very latest developments in fuel injection systems, control devices and other auxiliary units. The Market Place, the classified, where-to-find-it section is an invaluable aid in locating the source of every engine part, accessory and service a diesel, dual-fuel and gas engine buyer, seller, and operator may require.

Order your copy of this great all-new DIESEL ENGINE CATALOG, Volume 20 now. The cost remains the same as in previous years, $10.00 post-paid. Order from DIESEL PROGRESS, Cole Station, Los Angeles 46, California. (For California delivery, please add sales tax.)

Navy League

The election of Thomas E. Hughes, General manager, Cleveland Diesel Engine Division, General Motors Corporation, Cleveland, Ohio, to the state presidency of the Navy League of the United States, was announced at the annual meeting of the Navy League, at Coronado, California. The Navy League is a civilian organization composed of people interested in Navy activities and impressed with the importance of the Navy to every American citizen.

Simultaneously, Mr. Hughes was appointed chairman of the Cleveland Advisory Council on Naval Affairs by Rear Admiral E. H. vonHeimburg, USN, Commandant, Fourth Naval District. The ACONA program is to provide Naval commands with civilian advice and assistance when requested.

Electric Equipment Bulletin

The Joy Manufacturing Co. announces publication of a 12-page, 2-color bulletin (No. B59) that illustrates and describes their electrical plugs and receptacles for the power connecting requirements of industry. The manufacturer states that this new sales piece provides brief, yet pertinent, details on Joy electrical connectors for all standard, as well as many special industrial, needs. Copies will be mailed without obligation. Requests should be sent to Dept. J-62, Joy Manufacturing Co., Henry W. Oliver Bldg., Pittsburgh 22, Pa.

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To obtain the maximum in economical governor service, Marquette Governors should be returned to our factory for reconditioning.
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ROLLER BEARING TEXTILE SPINDLES
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PRECISION PARTS AND ASSEMBLIES
FUEL OIL PUMPS AND INJECTORS
SPRING CLUTCHES

West Coast Diesel News

By James Joseph

LEICH SALES CORP., West Los Angeles, purchased a Fairbanks-Morse 180-hp @ 1800 rpm, 6-cylinder engine driving a 100 kw generator.

BENDIX INTERNATIONAL, a division of Bendix Aviation Corp., announces appointment of San Pedro's Crofton Diesel Engine Co. as southern California distributor for the Inertia Starter.

FOR THE NEW SEWAGE treatment plant, City of Oxnard (Calif.), a Buda 100-hp sludge gas-natural gas power unit to drive a Sutorbilt blower. Another Buda, a 60-hp sludge gas-natural gas unit, drives a Fairbanks-Morse sewage pump at the same facility. Sale through Los Angeles' Anderson-BeVier Co., Inc.

POWERING portable sawmills in the East Stanwood, Wash. area are two new GM 4-71, 4030C units, one purchased by Ed Hage, the other by Norman Sands, both units from Seattle's Evans Engine and Equipment Co. Inc.

SOLD TO Wagner Tractor, Inc., by Hamilton Engine Sales, Inc., for delivery in the Pendleton (Ore.) area, four model 6DT-317 Buda diesel engines to power TR-6 tractors. Farm-working tractors were sold through Wagner representative, the Vaughn Co., Ltd.

A BUDA 6DT-468, powering a Wagner TR-9 tractor, has been delivered to Pilot Rock Lumber Co., for logging in the Pilot Rock, Ore. district.

FOR THE BOAT *Pacific Star*, a GM 3061-A diesel engine to drive a 30-kw generator, supplying power for all the vessel's auxiliaries. Sam Lonero, Monterey, Calif. is the *Pacific Star's* owner.

INSTALLED IN A LOS ANGELES Harbor Dept. harbor ~~scavenger~~, a GM 45200-RH diesel engine swinging a 20x18 R.H. propeller through 2:1 reduction.

SIX 20-KW DC GM generator sets (Model 2064-B) have been purchased by South Coast Shipyard (via Crofton Diesel Engine Co. Inc., San Pedro) for installation in U.S. Navy sub-chasers.

DIAMOND MATCH CO's Spokane, Wash. plant has taken delivery of a Fairbanks-Morse Model 45B3-1/8 generating set, announces F-M's diesel division manager, C. E. Dietle.

FOR THE YACHT *Monsoon*, owned by Mr. Radcliff, San Diego, a GM 45200 engine swinging a 26x20 prop through 3:1 reduction.

SPEED OF THE BOAT *Clarwalt*, owned by Bill Mollison, Newport Beach, Calif., has been upped to 21 mph through recent installation of two GM 6-71's with 1:1/2 reductions. Engines replace two older models.

FRANK CRIVELLO'S *Cape Zefferano* (San Diego) has been outfitted with a new auxiliary engine, a GM 23300.

TWO FAIRBANKS-MORSE 58-hp Model 49B4 1/2 power units have been sold to Bert Westlake, Bennington, Ida.

FOR THE *Vaenger*, owned by Landon R. Gray, Palos Verdes Estates, Calif., a GM 43200-RH with 3:1 reduction. Engine drives a 26x20 R.H. prop, housed in neoprene sheer mounts and driven through a Morse flexible coupling.

TO LEXINGTON, OREGON'S Lexington Implement Co., a Fairbanks-Morse 13 1/2-hp diesel, Model 48AS3 1/2.

Nordberg Bulletin

Publication of a new eight page bulletin, "Nordberg Supairthermal Engine-Gear Set" for driving centrifugal compressors and high speed pumps is announced by

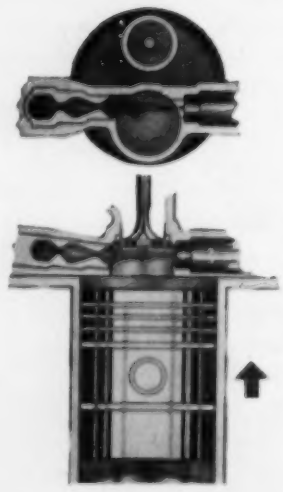
Lanova energy-cell controls combustion.

Paired cylinder blocks and heads removable from crankcase.

Continuous-duty work-type construction.

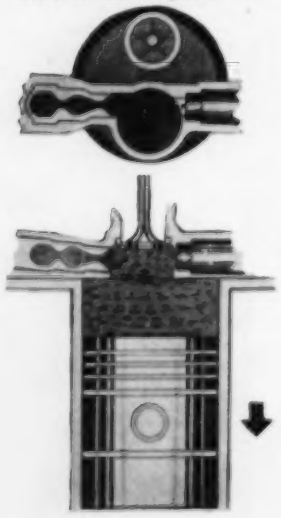
Package unit accessories of integrated design.

17 "ideas" work together t



MM controlled combustion features improved injection and reduced peak pressures for lower maintenance cost.

Energy-cell combustion results in complete fuel mixing and exact timing for controlled power and extremely low fuel consumption.



From top to bottom new Minneapolis-Moline Diesels are loaded with an unusual combination of features that work together to deliver a new high in dependable, profitable operation. Here's the check list of complementing "ideas" which exceed ordinary precision and quality requirements, actually push service dates apart, push cost charts down.

MM Diesels offer:

- Manifold crankcase ventilation
- Removable energy-cell combustion
- Self-cleaning pintle-type nozzles
- O-ring nozzle seals
- Two coolant directors for each

MINNEAPOLIS MOLINE MM MODERN MACHINERY

Nordberg Manufacturing Company, Milwaukee 1, Wisconsin. Bulletin 237 describes the advantages of the Nordberg Supairthermal V-Type engine-gear set for operation on large capacity gas pipe lines. For example, it is claimed that the Nordberg-Supairthermal engine driving a centrifugal gas compressor through a Nordberg-built speed increasing gear can save thousands of dollars in fuel costs. Such performance is possible because of the exclusive design principles of the Supairthermal engine which permit a thermal efficiency of better than 40%—with increased horsepower, lower lube oil consumption, and lower maintenance costs per horsepower hour.

In addition, the bulletin points up the compactness and efficiency of the Nordberg Supairthermal engine-gear set and explains why it can be installed with lower capital investment and operated at lower cost per horsepower hour than other types of gas pipe line prime movers. Illustrations show the engine-gear set driving a centrifugal compressor and the details of the Nordberg-built speed increasing gear. Bulletin 237 is available free upon request to Nordberg.

Tune-Up and Break-In Oil

Micro-Lube, a specially processed, patented lubricating oil for blending with crankcase oil and fuel in all types of internal combustion engines using gasoline, diesel fuel or natural gas, according to the manufacturer, is recommended for use in tune-up and break-in periods since it reduces friction and hard starting. Micro-Lube acts to eliminate the formation of sludge, carbon and varnish by disintegrating the binders of these causes of engine sluggishness. It is also said to remove the condensation in fuel tank and line, when blended with the fuel. It also removes crankcase condensation.

The oil is further recommended as an inhibitor in the prevention of rust and corrosion. It has a high affinity for metal surfaces, leaving a microscopic film of lubrication for cold starts. The blending of Micro-Lube as recommended with lubricating oil does not change the viscosity of the oil. Reports of laboratory and user tests and complete list of recommended uses for Micro-Lube are available from the manufacturers, Micro-Lube Sales, 2030 Irving Blvd., Dallas, Texas.

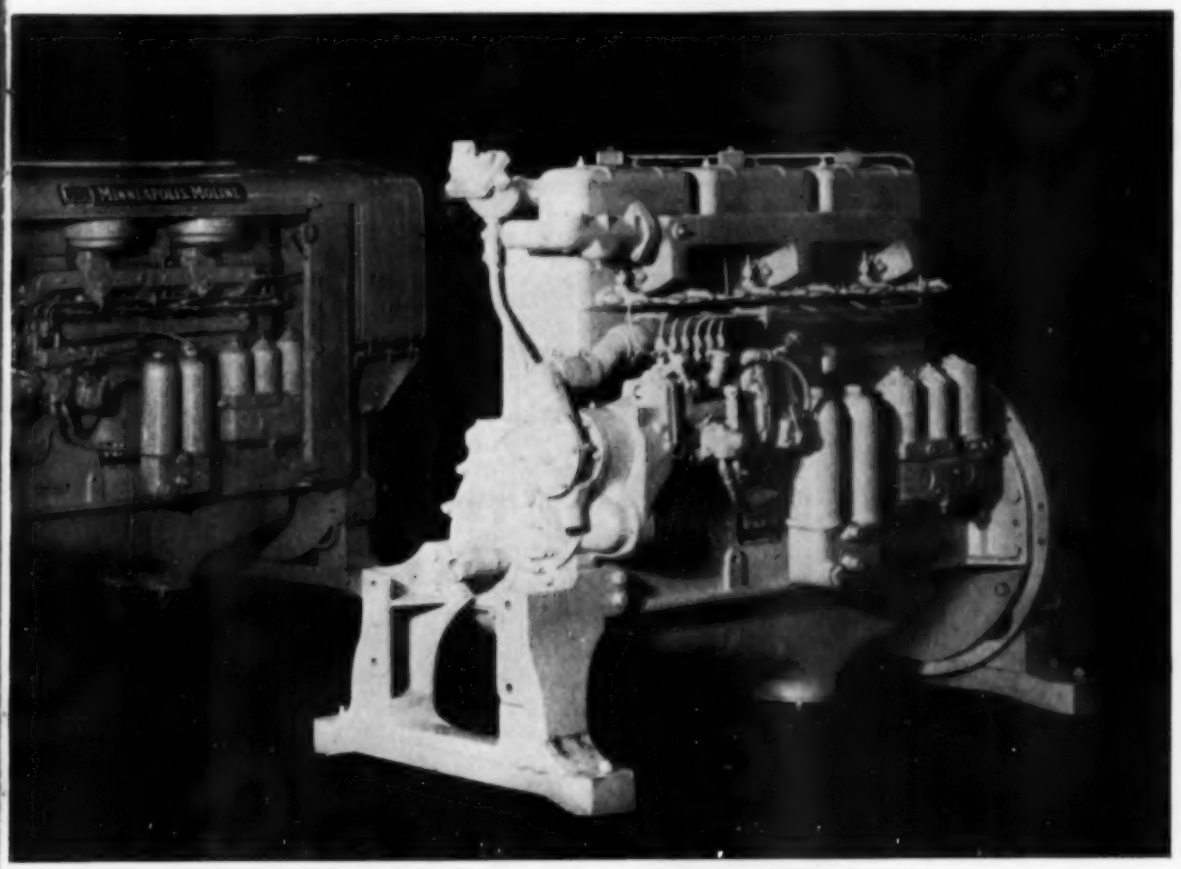
Bulletin On Compressor

Allis-Chalmers two-stage sliding vane type compressors for shop air, gas handling, drilling, and many other applications are described in a new bulletin released by the company. Built in various sizes to deliver air at pressures from 60 to 125 pounds gauge, the compressors are designed for low maintenance and constant efficiency. In addition to a table of ratings for the two-stage compressor, the bulletin carries a table of outline dimensions for the units. Copies of the bulletin, "Two-Stage 'Ro-Flo' compressors," 16B8244, are available on request from Allis-Chalmers Manufacturing Company, 961 S. 70th Street, Milwaukee, Wisconsin. (ITS NEW)

Awards Engine Contract

The City of Auburn, Nebraska has recently awarded a contract to Worthington Corporation for a new 12-cylinder, 2141 kilowatt dual fuel diesel driven generator. This new unit will be installed in an addition to Auburn's present municipal power plant. It will be the first twelve-cylinder Vee dual fuel engine in Worthington's line of high pressure, turbo-super-charged engines.

IT'S HERE! JUST OFF THE PRESS! Bigger, better, completely revised, rewritten and brought up to date. It's Volume 20 of DIESEL ENGINE CATALOG, now ready for mailing. Mail orders are now being filled for this giant reference book with its all-new, profusely illustrated engine and accessory sections. Orders are being accepted for this limited edition, which costs $10 postpaid plus California sales tax where applicable. Send checks or company form orders to DIESEL PROGRESS, Cole Station, Los Angeles 46, California.

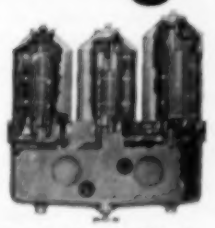


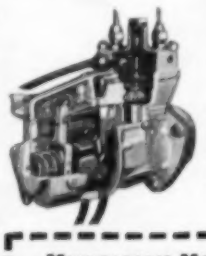
to offer New Diesel Savings

combustion chamber ◀Stellite exhaust valve seats ◀Removable cylinder blocks (of close grain iron that outlast sleeves) ◀Trunk-type aluminum pistons (camground and tinplated) ◀Drop forged, heat treated connecting rods and crankshafts with ample bearing surface ◀Head and cylinder combustion pressures are transmitted by full length studs anchored in the crankcase ◀Crankcase has extra depth below center line of crankshaft ◀Heavy cast base pan has wide flange that gives effective 360° rear main bearing support ◀Package unit water pump ◀Gravity fuel flow through first and second filters ◀Fuel transfer pump and entire governor included in injection pump package ◀Specially designed torque plate control for each model provides reserve power and reduced fuel consumption ◀Oil filters are crankcase-enclosed or dual full-flow types.

For your power application it will pay to get fuel facts and specifications on Minneapolis-Moline Diesels —the engines that make "ideas" work for you. See your MM dealer-distributor or write for complete Diesel facts.

Compact 3-stage filter unit with easy access for service.





Single-plunger Bosch injection for minimum maintenance and safety-bypass return to fuel tank.

MINNEAPOLIS-MOLINE, DEPT. D2
MINNEAPOLIS 1, MINN.

Please send me literature on MM Diesels. I'd like the following complete specifications and price quotations:

4 cyl. 283 cu. in. ☐ complete unit ☐ bare engine
6 cyl. 425 cu. in. ☐ complete unit ☐ bare engine
6 cyl. 605 cu. in. ☐ complete unit ☐ bare engine

Name.....
Firm Name.....
Address.....
.....

MINNEAPOLIS-MOLINE
MINNEAPOLIS 1, MINNESOTA

Straws in Todays Business News

AMERICAN INTERESTS have combined forces with Daimler-Benz AG, Stuttgart, West Germany, builder of Mercedes Benz cars and Unimog trucks, to form Daimler-Benz North American, Inc. The German firm already operates sales agencies for its cars in the U.S. The newly formed company will establish production facilities for dieselized trucks. One of the largest exhibits at the Canadian International Trade Fair, held early in June in Toronto, showed Mercedes cars, Unimog trucks, tractors and diesels.

MACK TRUCKS, Inc. recently received a $9,000,000 order for 440 buses from the San Francisco Transit Authority. One hundred buses are to be delivered during 1955, with the balance scheduled for delivery over the next five years. The 48-passenger buses are to be powered with Mack's thermodyne turbocharged diesel engines.

ROBERT S. STEVENSON, new president of Allis-Chalmers Manufacturing Co., in a recent report to shareholders said, in part: "You will remember that we acquired the Buda Co. in late 1953. While Buda was a producer of railroad equipment and industrial lift trucks, our major interest was that they were a long-time reputable producer of engines—particularly diesel engines— and we needed our own source of diesel engines for the construction and agricultural tractors and machines produced by our tractor division. I think you would like to know that Buda has been well integrated, as a division of this company, and that engines from this plant now power two new sizes of crawler tractors, a wheel tractor, and some earth-moving machines, all with excellent acceptance—and more to come."

AMERICAN RAILROADS, in the first three months of 1955, installed and serviced 306 new locomotives, all of which were diesel-electric except for three electric units. On April 1, the rails had 428 new locomotives on order, including 421 diesel-electric and 7 electric units.

AMONG lines of credit recently extended by the Export-Import Bank are these: to Westinghouse Air Brake International Co., $6,100,000 to help finance export of railroad brake and signalling equipment, compressors, and mining and drilling gear; to Joy Manufacturing Co., $1,300,000 to help finance sale of mining and industrial equipment; to Iowa Manufacturing Company, $600,000 to finance export of crushing and conveyor equipment and other machinery; to Ellicott Machine Corp., $840,000 to finance sale of a 24-in. dredge and other equipment, valued at $1,869,000, to Asociacion Nacional de Navieros of Columbia.

THE CONTINUOUS BOOM in construction, with its resultant shortage in cement, has led two major producers to announce extensive expansion plans. Directors of the Ideal Cement Co., have approved a long-range program that may cost in the neighborhood of $55,000,000, and which will boost capacity about 50%. A new $8,000,000 plant is planned for Houston, Texas. Other plants to cost between $5,000,000 and $6,500,000 each, are slated for Ada, Okla., Trident, Mont., and Superior, Neb. In August, work will start on a $4,000,000 expansion of the Permanente Cement Co. plant near San Jose, Calif.

CONSOLIDATED Diesel Electric Corp. has received a contract to manufacture 501 portable generating sets for the Army at a price of $2,437,546.

THE CITY of Baltimore has awarded a contract to Thomas D. Bowes, naval architect and engineer, to design and supervise the construction of a new 12,000 gal. fireboat. Two 600 hp propulsion and two 660 hp pumping engines will be F-M opposed piston diesels.

THE ST. LAWRENCE Seaway project continues stimulating business with Alco Products, Inc. receiving a contract for $1,017,183, for lock and spill-way towers, guides, sills and dogs. The contract is expected to run through March, 1957.

FIFTY ALL-PURPOSE diesel-electric road switching locomotives, to cost $9,400,000, recently were ordered by the Pennsylvania Railroad from the Electro-Motive division, General Motors Corp. They will replace 66 steam locomotives, and will bring the road's diesel fleet to 1476.

ALUMINUM CO. of America announced plans to install a $20-million hot sheet rolling mill, said to be the widest ever designed and built for the aluminum industry, at Davenport, Iowa. When in operation, in about two years, the 160-in.-wide mill will add about 725 persons to the payroll at the plant, which now exceeds 2,000.

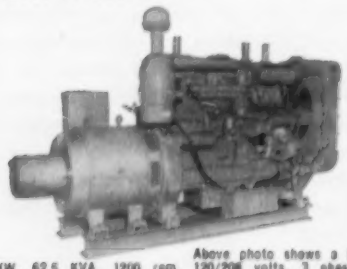
MORRISON-KNUDSEN CO., completed domestic construction in 1954 valued at $137,258,000, and says its volume for 1955 will equal or exceed that figure. Uncompleted construction contracts on the books, March 31, totaled $173,300,000 compared with $160,639,000 at the beginning of 1955, and $150,-

KATO

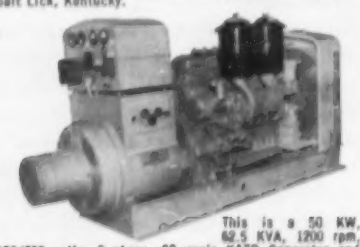
Continuous A.C. Standby Power

GENERATORS

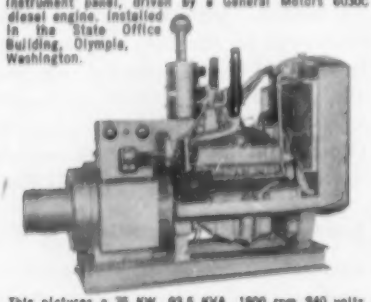
. . . a size and type to meet your needs to 400 kw



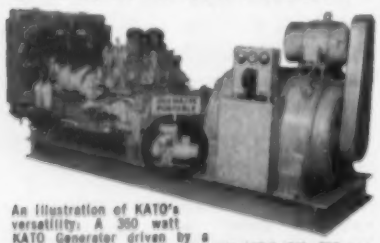
Above photo shows a 50 KW, 62.5 KVA, 1200 rpm. 120/208 volts, 3 phase, 60 cycle KATO Generator and instrument panel, driven by an International Model UD-18A diesel engine. Installed for the Mechanical Construction Division in Salt Lick, Kentucky.



This is a 50 KW, 62.5 KVA, 1200 rpm, 120/208 volts, 3 phase, 60 cycle KATO Generator and instrument panel, driven by a General Motors 6030C diesel engine. Installed in the State Office Building, Olympia, Washington.



This pictures a 75 KW, 93.5 KVA, 1800 rpm, 240 volts, 3 phase, 60 cycle KATO Generator and instrument panel, driven by an H-640 Lathel engine utilizing natural gas for fuel. For Republic Steel Corporation of Gary, Ind.



An illustration of KATO's versatility: A 350 watt KATO Generator driven by a Lauson LMH engine and a 150 KW, 187.5 KVA, 750 rpm, 120/208 volts, 3 phase, 25 cycle KATO Generator and instrument panel—driven by a General Motors twin 6-71 diesel engine. For Duluth, Missabi & Iron Range Railway.

Your Inquiries Invited.

Builders of Fine Electrical Machinery Since 1928

KATO Engineering Company

1443 First Avenue, Mankato, Minnesota

Quincy COMPRESSORS STANDARD

. . . ON

ATLAS IMPERIAL DIESELS

The National Supply Company has standardized on Quincy Compressors for starting their Model 45 Atlas Imperial Engines. Atlas Diesels are known for their dependability. And an engine is just as dependable as its accessories, so National engineers have selected Quincy — the finest in air compressors.

You want dependability too, so standardize on Quincy Compressors.

There's a model for every application. Sizes run from 1 to 90 c. f. m.

Write Dept. K-44, Quincy Compressor Co., Quincy, Illinois, for more information on Quincy units for diesel starting.

QUINCY COMPRESSOR CO.
QUINCY, ILLINOIS

MAKERS OF THE WORLD'S FINEST AIR COMPRESSORS

889,000 at the same time last year. Morrison-Knudsen, in a group with Peter Kiewit Sons and Nacco Corp.-Stolte, Inc., was low bidder on the Tri-Dam Project in California. The group bid $31,200,000 on the contract which includes construction of dams, power houses, etc., on the Stanislaus River.

INTERNATIONAL Harvester Co. has been awarded a contract for 375 parcel delivery trucks by the post office department. Cost of the trucks is to be $823,000.

NORFOLK & PORTSMITH Belt Line Railroad plans a dieselization program that will eliminate steam by the end of 1956. Cost of the program will approach $2,000,000. The first five diesel electric road switchers, of 1200 hp, are to be ordered from the Electro-Motive Division of GMC. Two more orders of five locomotives each, will be placed within the next 18 months. Officials expect the 15 diesels to do the work of 23 steam.

WASHINGTON Water Power Co. is to start construction this month on the $79,500,000 Nexon Rapids Dam in Eastern Montana. Work includes building a 190-ft. high concrete and earth-filled dam, one mile in length; a powerhouse; and relocation of Northern Pacific tracks.

DEMAND for steel continues to keep the nation's producers at near-capacity levels, and Inland Steel Co. plans to increase the capacity of its Indiana Harbor Works by 200,000 tons a year. This will bring Inland's capacity to 5,200,000 tons by early 1956.

WITHOUT revealing the make, The Norfolk & Western Railway has announced it will buy 8 general purpose diesel locomotives to cost about $1,400,000 for delivery in September. These will be the first diesels owned by the railway,—the backbone of whose business is hauling bituminous coal. The line plans to use steam for heavy-duty service.

WHILE the exact size and nature of the Federal highway building program is being debated in Congress, there is no question but that some action will be taken which will stimulate a vast amount of engineering construction work for a period of years. In the meantime, various localized steps include: Maryland State Roads Commission offered a $25,000,000 highway bond issue,—second installment in the state's 12-year highway overhaul program, which will amount to $330,000,000. Florida State Turnpike Authority sold a 74-million dollar bond issue to finance the first portion of a road building project that will cost about $284,000,000. The turnpike is to connect Jacksonville and Miami.

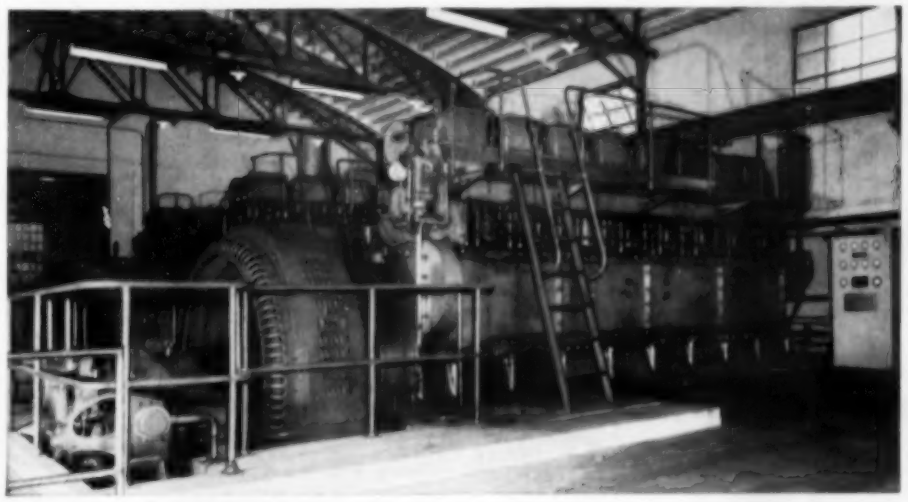
FRUEHAUF Trailer Co. expects the first half of this year to be the greatest in business volume in the company's history, with a total of $100,000,000. Stockholders recently were told of orders for 1440 civilian commercial trailers amounting to $8,000,000.

WHAT MAY develop into a new and extensive market for automotive diesels recently was revealed jointly by the Crown Body & Coach Corp., and Cummins Service & Sales, both of Los Angeles. What is believed to be the nation's first modern dieselized transit school bus has been delivered to a school district near Bakersfield, Calif. The Crown Supercoach hauls 79 passengers on 13 rows of forward-facing seats. A Model NHHB-600 Cummins diesel is mounted under the floor, amidships. This is a horizontal engine developing 200 hp at 2100 rpm. According to the Los Angeles Cummins organization, operating records disclose fuel savings over gasoline-powered buses as great as 3¢ per mile.

IT'S HERE! JUST OFF THE PRESS! Bigger, better, completely revised, rewritten and brought up to date. It's Volume 20 of DIESEL ENGINE CATALOG, now ready for mailing. Mail orders are now being filled for this giant reference book with its all-new, profusely illustrated engine and accessory sections. Orders are being accepted for this limited edition, which costs $10 postpaid plus California sales tax where applicable. Send checks or company form orders to DIESEL PROGRESS, Cole Station, Los Angeles 46, California.

Fuel oil savings, 50% longer service ... thanks to Koppers Piston Rings

... Koppers Piston Rings, Municipal Power Plant, Tarboro, N.C.



Here's proof *that installation of Koppers Piston Rings can save on fuel, lubricating oil, labor costs.*

In conducting routine maintenance operations of the Municipal Power Plant, Tarboro, N. C., it was decided to install a new type of American Hammered Piston Ring.

Tarboro now uses #5 fuel oil (for which diesel was originally designed.) *Result: Tremendous Savings in fuel costs.*

In addition, compression has been increased . . . lubrication oil consumption decreased 200%-300%. And thanks to Koppers Piston Rings, cylinder wear has been less than .010 inches after 15 months of operation even under difficult working conditions. Think what that means in longer service, less down-time, lower labor costs.

There are many cases in which the installation of Koppers Piston Rings has proved helpful in getting economical engine performance. Does this suggest savings in operating and replacement costs to you? Then remember Koppers Piston Rings next time you have a diesel overhaul. First thing, investigate Koppers Conformable and Porous Chrome* Rings. And for special assistance with your specific piston ring problems, consult our technical staff.

Koppers Porous Chrome* Rings. Porous chrome surface holds and distributes oil during break-in. Seats quickly. This chrome prevents grit from embedding in ring surface. Prevents cylinder wall scratching. Reduces wear 50%. Last 4 times longer than other rings.

Koppers Conformable Ring maintains constant unit pressure for positive oil control. Conforms readily to meet cylinder distortion because flexible cast iron member is pressed outward by abutment type spring which exerts uniform radial pressure around entire circumference.

*Van der Horst Process

KOPPERS

METAL PRODUCTS DIVISION • KOPPERS COMPANY, INC. • Baltimore, Maryland

This Koppers Division also supplies industry with Fast's Couplings, Aeromaster Fans, Koppers Electrostatic Precipitators and Gas Apparatus.

Engineered Products Sold with Service

AMERICAN HAMMERED
Industrial Piston Rings

KOPPERS COMPANY, INC., *Piston Ring Dept.*, 1587 Hamburg Street, Baltimore 3, Md.
Gentlemen: Please send me full information on your Conformable Oil Ring.

Name .....
Company .....
Address .....
City ..... Zone ..... State .....

Diversifies Product Range

New leadership under the presidency of Ralph F. Peo, is bringing the Houdaille-Hershey Corp. of Detroit into the news, following Houdaille's acquisition from Frontier Industries, Inc., Buffalo, N. Y., of a group of diversified plants. Stockholders of both companies approved the purchase which adds a highly diversified range of products to the automotive, aircraft and refrigeration lines which have constituted the major output of Houdaille.

Still further diversification will be the policy, according to Mr. Peo. Facilities will be realigned and operating efficiency increased so as to strengthen the company's competitive position.

Camshaft Grinder

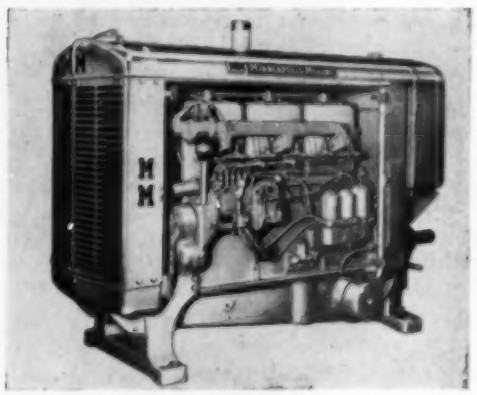
One of the latest automotive engine rebuilding machines developed by Storm-Vulcan, Inc., Dallas, Texas, is the model 75 camshaft grinder for automotive diesel, and industrial engines. This camshaft grinder was designed to re-grind camshafts to original or later model specifications which greatly improve the performance and power of the motor. Also, camshafts can be ground to special order for such engines as racing cars and "hot rods." A camshaft can be reground on this machine at a fraction of the cost of a new unit.

Some of the outstanding features of this machine include accurate indexing that eliminates guesswork because the sliding pin gives positive location when changing from lobe to lobe; quick change from intake to exhaust masters with selector knob.

Master cams are ground right on the machine using a straight line transfer head for duplicating the cam contour. Specifications: range, 6½-in., swing will handle up to 99-in. shafts, 50-in. between centers. Weight 4,250 lbs. net. Floor specifications: Height 50-in., width 40-in., length 84½-in.

Complete catalog and information available from Storm-Vulcan, Inc., 2225 Burbank St., Dallas, Tex.

New Diesel Unit



The new Minneapolis-Moline D605-6A Diesel unit.

A new 105 hp diesel unit with an exclusive water-jacketed base pan has been announced by Minneapolis-Moline Company, manufacturers of farm machinery and power units. Termed the D605-6A, the new power unit is of heavy-duty industrial design with six cylinders. Bore is 4⅝-in. and stroke is 6-in. Piston displacement is 605 cubic inches.

Announced as exclusive with MM is the "thermo-clad" construction of the base pan. This is a completely coolant-jacketed base pan, through which coolant circulates continuously. Uniform operating temperature from cylinder heads to bottom of base pan is maintained by this new MM engineering development. Two large oil filters, with 6½-in.x 9-in. cartridges, are enclosed in the base pan, with covers on each side for ease of access. Cylinder heads are cast in pairs, and have special coolant nozzles for each combustion chamber to direct the coolant to the hottest parts of the heads.

EATON
Valves and Bolts
FOR DIESEL ENGINES

Eaton Diesel engine parts combine the experience of many years as suppliers to the Diesel engine industry with the most modern precision production facilities—plus a thorough understanding of the problems peculiar to the Diesel engine field.

Eaton engineers will welcome the opportunity to discuss the application of Eaton Valves and Bolts to your engines.

EATON
VALVE DIVISION
MANUFACTURING COMPANY
9771 FRENCH ROAD • DETROIT 13, MICHIGAN
General Offices: CLEVELAND, OHIO

PRODUCTS: Sodium Cooled, Poppet, and Free Valves • Tappets • Hydraulic Valve Lifters • Valve Seat Inserts • Jet Engine Parts • Rotor Pumps • Motor Truck Axles • Permanent Mold Gray Iron Castings • Heater Defroster Units • Snap Rings Springlites • Spring Washers • Cold Drawn Steel • Stampings • Leaf and Coil Springs • Dynamatic Drives, Brakes, Dynamometers

The combustion chambers are designed for progressive burning of diesel fuel to give sustained power strokes. The "energy cell" in each cylinder regulates the burning of gasses and increases rotary turbulence of the gas for steady, thorough, clean burning of the fuel. A multiple-plunger American-Bosch injection pump gives quick response and accurately meters the fuel for heavy load demands. The governor is enclosed in a dust-proof housing, integral with the pump. A specially-designed torque plate assures proper torque build-up to handle lugging loads. Self-cleaning pintle-type fuel nozzles are installed with o-ring seals for protection against oil leakage, and for easy removal in servicing.

The 3-stage fuel filter is gravity-fed through the primary and secondary stages. An exclusive MM-patented by-pass between secondary and final stages prevents dirt or other abrasive material from being forced into the close-fitting injection parts. Optional equipment includes attachments for cold-weather starting; fuel cut-off to stop the engine in case of insufficient oil pressure or excessive water temperature; and oil level controller. Sight oil glass is standard equipment. Crankshaft and crankcase are of unusually heavy construction. (ITS NEW)

Elected Chairman and President of White Motor

Robert F. Black

Directors of The White Motor Company have announced the election of Robert F. Black to the newly-created position of chairman of the board and his re-election as president and chief executive officer of the company at an organization meeting following the annual meeting of stockholders. At the same time, vice presidents J. N. Bauman, V. W. Fries and E. S. Reddig were named executive vice presidents, the announcement said. These new executive vice presidents, together with Mr. Black constitute the operating committee.

In addition, Mr. Bauman, previously vice president of sales, will function as head of the entire White Truck Division. Mr. Fries, formerly vice president of Production, will have the responsibility of coordinating the manufacturing and distribution of current and new products not strictly automotive, both commercial and Government, that will be produced in all White plants. Mr. Reddig, vice president of Finance, will, in addition, be the chief administrative officer of the Company.

Reorganizes

Reorganization of the Diesel Energy Corporation, New York City, to develop a nation-wide sales and service organization for the products of Kloeckner-Humboldt-Deutz AG, 90-year-old maker of diesels in Cologne, Germany, was recently announced by Maximilian B. Bauer, vice president. The corporation will concentrate on selling air-cooled diesel engines in the United States.

Deutz started working on the development of air-cooled diesel engines in 1935. Seven years later, the first truck engine, having 70 hp. was ready for production. The engine passed the severest tests in ambient air temperatures from minus 40° to plus 145°F. Diesel Energy Corp. states that the air-cooled Deutz diesel engine is built in a range from one to twelve cylinders, developing from eight to 250 bhp. More than 100,000 are in operation. These engines (V and straight types) are designed for trucks, tractors, buses, for marine applications, locomotives and rail-cars; furthermore for compressor-sets, pump-sets, generator sets, for cranes, building machinery, as well as for use in oil fields.

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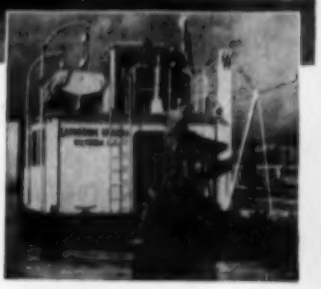
Above, Ferry Balfour, British Columbia, powered and steered with two Harbormasters.



Catherine Graham, showing Harbormaster elevated for inspection.

Harbormasters are ready answer to many tough marine power and steering problems

these heavy duty outboard propulsion and steering units are a complete package, compact and easily installed

Quickly and easily installed

Harbormasters are assembled and tested at the plant and are ready for immediate use on barges, ferries, fishing craft, tows, lighters, dredges, etc. In many cases Harbormasters can be installed and ready to go merely by mounting with four hold-down bolts. Even on largest units, only fuel tanks and controls are installed separately.

Outstanding maneuverability

You have 360-degree maneuverability and can dock or maneuver in crowded quarters, stay headed into the current on sharp river bends or in tide rips, run into locks without losing time, shunt or pick up barges with precision, or reverse with full power.

Rugged-Powerful

With these outboards you get more actual delivered thrust per H.P. than with the same engine with an inboard system. Harbormasters are heavy duty equipment, built ruggedly for long life. They are ideal for coastwise service as well as in harbors, lakes, canals, and rivers.

Easy service and maintenance

Special 180° elevating mechanism allows one-man operator to raise entire submerged assembly to any degree he desires. No dry docking or diving is necessary for repairs.

Shallow water protection

In shallow water, shear pin lets tail section ride up and over submerged obstacles. Shear pin is easily replaced while underway. If desired, the unit can be operated with tail section in partially elevated position to reduce draft.

Models and installations to meet your needs

Four series are available with models ranging from 40 to 400 h.p. All are designed for installation on existing powered or unpowered craft and on new craft of all types. In many cases the installation can be made with no alterations to the hull whatever.

Harbormaster Outboard Propulsion and Steering is the money-saving way to solve many tough marine power and steering problems. Recommendations are available without charge, based on hundreds of installations. Send for New Catalog giving complete information and showing many Harbormasters in action.

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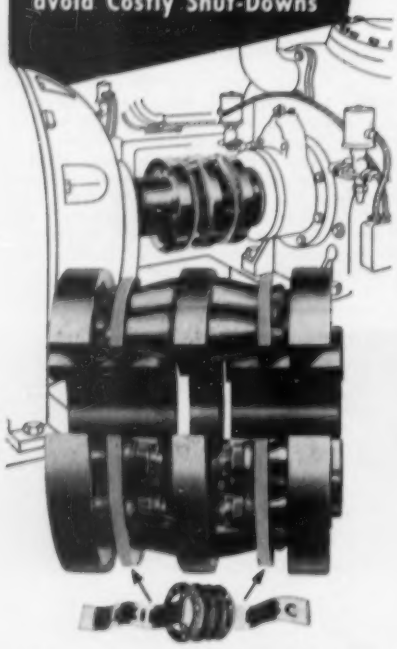
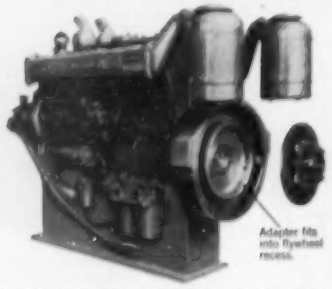
FLEXIBLE COUPLINGS
for Power Transmission to avoid Costly Shut-Downs



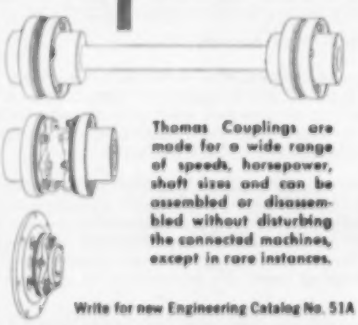
Patented Flexible Disc Rings of special steel transmit the power and provide for parallel and angular misalignment as well as free end float.



Typical Flywheel Adapter Application

DISTINCTIVE ADVANTAGES

FACTS	EXPLANATION
NO MAINTENANCE	Requires No Attention. Visual Inspection While Operating.
NO LUBRICATION	No Wearing Parts. Freedom from Shut-downs.
NO BACKLASH	No Loose Parts. All Parts Solidly Bolted.
CAN NOT "CREATE" THRUST	Free End Float under Load and Misalignment. No Rubbing Action to cause Axial Movement.
PERMANENT TORSIONAL CHARACTERISTICS	Drives Like a Solid Coupling. Elastic Constant Does Not Change. Original Balance is Maintained.

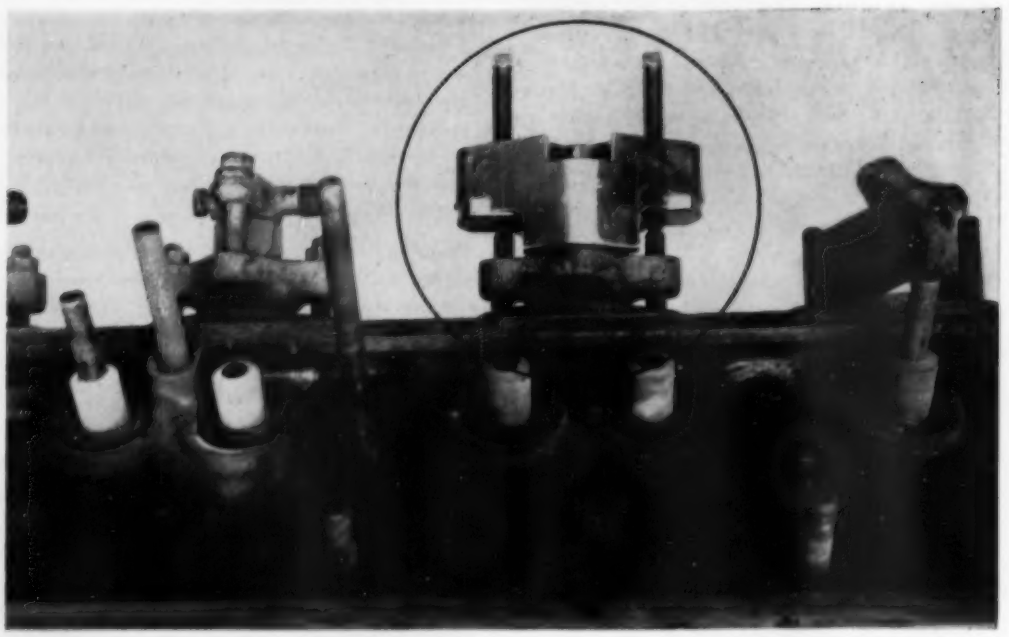


Thomas Couplings are made for a wide range of speeds, horsepower, shaft sizes and can be assembled or disassembled without disturbing the connected machines, except in rare instances.

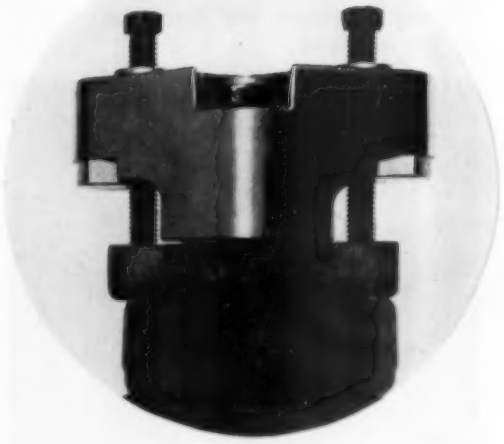
Write for new Engineering Catalog No. 51A

THOMAS FLEXIBLE COUPLING CO.
WARREN, PENNSYLVANIA, U.S.A.

Invents Tool for IHC Diesels



AN injection valve and nozzle body puller for IHC diesels has been invented by Al Pardo, owner of Southwest Diesel Injection Co., Phoenix, Ariz. Of universal type, the tool makes it easy to remove injector assemblies from International Model UD and TD 6A, 9A, 14A, 16A and 18A engines, and nozzle body holders from UD and TD 6, 9, 14 and 18 engines. To limit the size of the puller, Mr. Pardo did not adapt it for the large 24 series engines, but expects to manufacture a tool for this series later.



In working on injector valves currently used on "A" series International engines, the nozzle fitting is removed, as are the two nuts that secure the nozzle body to the head. The puller is fastened to the nozzle body with two cap screws. The jacking screws then are centered over the nozzle body studs. A standard ⅝-in. open-end wrench, according to the inventor, provides more than enough leverage to turn the jacking screws and remove "even the most stubborn nozzle bodies."

"The nozzle body retainers in the accompanying photographs," Mr. Pardo states, "were removed from a cracked head that I picked up out of the junk pile at one of my customer's. The nozzle bodies were so badly rusted and carbon-sealed that they had been junked with the head. I wanted to give my new puller a 'final examination.' Even I was amazed at the ease with which I removed them. It didn't take more than two minutes, and this puller does not injure the studs."

In the case of the older type injectors, the injectors are removed first and then the puller is used to extract the nozzle body retainer, as described above.

The puller will sell for $15.00, and is guaranteed to do the job and satisfy the buyer. It is being manufactured and distributed by Hollar Tool Engineering Co., 4315 E. Washington St., Phoenix, Ariz.

St. Louis District Manager

L. C. Michie

L. C. Michie has been appointed St. Louis district manager for the Enterprise Engine & Machinery Co., San Francisco, subsidiary of General Metals Corporation, according to Arthur W. Ostrander, general sales manager of the concern. L. J. "Dutch" Robbins will continue as the Enterprise service engineer in the St. Louis district. Mr. Michie will direct the company's sales and service activities out of the St. Louis district. He was associated with Baldwin Locomotive Works diesel service division for 10 years, and with Fairbanks-Morse for 10 years as a service supervisor and diesel engine sales engineer.

"Lou" Michie is a member of the Propeller Club, Port of St. Louis. He will headquarter out of the Enterprise Engine & Machinery Co. District Office, at 3760 Eiler Street, St. Louis, Missouri.

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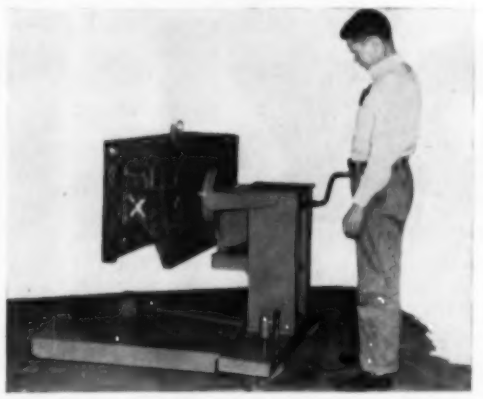
Engine Overhaul Stand

We have received further information and illustrations on the Clayborne #900 engine stand described in the June issue of DIESEL PROGRESS and we want to pass it along. The illustration below shows a GM 6-110 diesel engine block mounted on the stand in an upright position. This is the way all engines are positioned onto the stand. Note the convenient height of the engine on the stand relative to the floor.

The next illustration below shows the GM 6-110 engine block up-side-down with the crankshaft bearings up. Note how the 90 degree segment worm and worm gear operates to turn the engine over into any desired working position.



The above illustrations clearly show how this new engine overhaul stand has been designed to be easily accessible from the floor and how it is made possible and simple by just turning the crank handle on the stand to position the engine most efficiently for any particular job like installing bearings or piston assemblies, for example. For further information write to Clayborne Mfg. Co., 429 North Main Street, Monticello, Indiana.

Orders Mechanical Reefer Units

The Santa Fe has recently placed an order for 140 more freight car refrigeration units with The Trane Company in answer to the homemaker's growing demand for frozen foods. This order, one of the largest of its kind ever placed by a single railroad raised to 580 the number of mechanically refrigerated cars being built by railroads. Santa Fe will build the 140 cars along with 10 other mechanical reefers at its West Wichita, Kansas Shops.

Intended particularly for frozen foods, the new equipment will provide temperatures of zero to 10 below for the 50-foot-long, super-insulated cars which contain 3054 cu. ft. of space, 55 percent more than Santa Fe's conventional 40-ft. reefers.

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Unusual opportunity exists for top man in newly established division of nationally known concern located in Southern California.

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Write fully, stating experience and salary requirements.

All inquiries held strictly confidential.

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- This report completely evaluates abrasive removal properties of various types of lubricating oil filter elements now in use on locomotive diesel engines.

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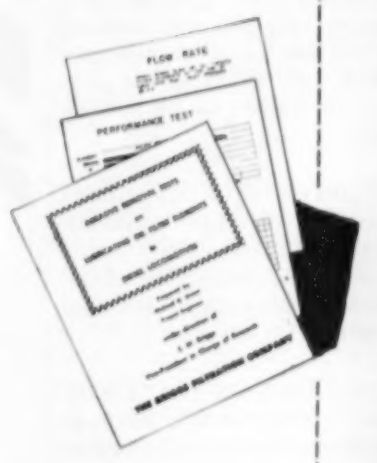

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Florida Diesel News

By **Ed Dennis**

AT LIARS LAIR in the Florida Keys, Mrs. B. A. Linderman had a Model 45 Fairbanks-Morse 6-kw generating set installed. This 10-hp diesel is the only source of power on the island.

THE 180-FT. WEST INDIES freighter *Jacks Bay* is the latest addition to the Three Bays Line. It is powered with two 12-cylinder Model 567-A General Motors diesels rated 900 hp each. Other vessels include the *Cotton Bay* and *Winding Bay* each with two 900-hp Cooper-Bessemer diesels and the *Ariana Bay* with a 10-cylinder Fairbanks-Morse O-P 1800 hp diesel.

FOR MAULE INDUSTRIES, INC., a Model HMDC Hough Payloader, 1½ cu. yd. capacity, with a 100-hp Hercules diesel and an Allison Torqmatic converter from Florida Georgia Tractor Co., Miami.

THE YACHT *FIREBALL* owned by James Edwards of Huntington, West Va., was repowered from gasoline to a pair of General Motors 6-71 diesels with Twin Disc 1.5:1 clutch and a 3-kw Onan diesel generating set by Ellis Diesel Sales & Service, Fort Lauderdale, Fla.

LE CIMENT D' HAITI of Port au Prince took delivery of a pair of UD-18 International diesel generating sets, each rated at 62.5 kva, for use in their cement plant, from Peninsular Armature Works, Miami.

IN HIALEAH, Andy's Trucking Service, put into operation their newly purchased ¾-yd. Link-Belt Speeder dragline, powered with a GM 3-71 diesel and power take-off. The machine has full hydraulic controls.

A 6-CYLINDER WAUKESHA DIESEL powers the new model LD-9 Scoopmobile for L. C. Morris Construction Co. Some of his other equipment includes a TD-18 International tractor and a Lima ¾-yd. dragline with 4-71 GM diesel.

FOR MAC DILL AIR FORCE BASE, Tampa, 3 Model 31A8½ Fairbanks-Morse diesel generating sets with 200 kw Fairbanks-Morse generators; to be used for water cooling on engines in the ordnance storage facilities; from Satchwell Electric Construction Co., Jacksonville.

TWO TD-24 INTERNATIONAL tractors, one for Largo Seaboard Properties on Key Largo, and the other for the L. & B. Corp. of Ocala, from Florida Georgia Tractor Co., Miami.

THE GULF COAST RESEARCH LABORATORY will receive a 42x14 research vessel powered with a Model 6DAMR 273 Buda diesel, rated 78 hp at 2400 rpm.

FROM SHELLEY Tractor & Equipment Co. for Seminole Rock Products 5 Caterpillar DW-15 tractors with 5 W-15 dirt wagons to replace 7 dump trucks of similar yardage.

J. FRANK KNORR, has been named president of the Miami International Boat Show's board of governors. He is chairman of the board of J. Frank Knorr Co., Miami and Tampa. Peggy Leyshon, executive director of the show, announced the show will be held Feb. 17-22, 1956.

PRINCETON FARMS, at Princeton, took delivery of a Caterpillar D-8 tractor from Shelley Tractor & Equipment Co. A similar model also was delivered to A. A. A. Builders of Miami.

TWO ENTERPRISE DIESELS, one 1040 hp and the other 650 hp, are to be installed in the 96x30 diesel-electric dredge being built for C. Toppino & Sons, Inc., Key West, by Dade Drydock.

You will be among the first to receive a copy if you order now. The same price as in former years, $10.00 for a reference volume that grows more valuable as each year passes.

DIESEL PROGRESS

FOR MOSQUITO CONTROL in Monroe county, a Drott bullclam shovel of one-yard capacity, powered by a TD-9 International diesel.

THE 55-FT. BILOXI-TYPE trawler *Miss Agnes* was powered with a M110 Murphy diesel while the 52-ft. yacht *Encore II* received two 165-hp General Motors series 71 diesels.

THE FIRST NEW D7 CATERPILLAR tractor with a 7A dozer blade in South Florida was delivered to E. C. Luccock of South Miami. This new 128-hp tractor was sold by Shelley Tractor Co. of Miami.

Named Manager of Division

H. A. Dietrich has been named manager of the Libertyville division of Burgess-Manning Company, manufacturers of industrial noise abating equipment, and F. C. Duerr has been appointed manager of the Chicago district of the company, S. G. Paddock, vice president, has announced.

Mr. Dietrich formerly was manager of the Chicago district and Mr. Duerr was sales engineer under him. As Libertyville division manager, Mr. Dietrich will have charge of industrial operations for such company products as exhaust and intake snubbers and silencers, water separators and waste heat recovery silencers, as well as other industrial noise abating devices. This operation is in conjuction with the Dallas division, which is managed by Mr. Paddock.

The Chicago District comprises the Northern Middle West and the Northern Far West with sales agencies in Detroit, St. Louis, Ames, Ia., and other cities. In addition to Libertyville, Ill., and Dallas divisions, the company also maintains the Architectural Products division in Chicago which manufacturers and sells doorless, acoustically treated telephone booths and a three-way functional radiant ceiling that heats or cools and incorporates sound control. A fourth company division was formed early this year when Burgess-Manning acquired the Penn Industrial Instrument Company by merger. This division manufactures electric and electronic flow meters and temperature and pressure control instruments.

Licenses Australian Firm

Alco Products, Inc. has announced that it has entered an agreement with A. E. Goodwin, Ltd. of Glede, Australia, for that firm's manufacture of Alco diesel-electrics in Australia. The first units built under the agreement will be six of Alco's "World" locomotives for the South Australian Railways. Diesel engines for the units will be built in Alco's Schenectady, N.Y. plant, while Goodwin, with the help of Alco specialists will manufacture most other components "down under." Goodwin has been active in the railway field, principally as a railway-car builder.

Alco officials said that the agreement covers Goodwin's manufacture of all Alco locomotive models. It is expected that the "World" locomotive, specially designed for overseas service, would comprise a large part of Goodwin's production of road locomotives, with Alco's switchers for yard and transfer operations. Australian railways, according to Alco officials, are turning more and more to diesel-electrics as new equipment. Alco has 20 diesels now in service in Australia, officials said, and two were used to pull the royal train when Queen Elizabeth visited there in 1954. The six "World" locomotives now building will be the first of this type in that part of the world, although others were recently sold to Spain, and to Pakistan. The locomotive is specifically for service overseas.

DIESEL ENGINE CATALOG

Volume 20

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Most editorial matter is either entirely new or extensively revised this year. The reason is that manufacturers of engines and accessories have brought out so many new models and products, and have revised so many old ones. You will need this new book to keep posted on a rapidly-moving industry.

The size and format of this new edition of the "bible of the industry" is the same as has proved so successful during the last 19 years. You will find the following sections:

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1. ENGINES. All major manufacturers of diesel, gas, and dual-fuel engines are represented. Text is supplemented with specifications, power curves, photographs and sectional views.

2. SUPERCHARGERS & TURBOCHARGERS. This section also is fully illustrated to help you keep abreast of developments in this expanding phase of the industry.

3. TRANSMISSIONS. This section gives you the latest information on torque converters, fluid drives, and other modern means of transmitting power.

4. ACCESSORY EQUIPMENT. Recent developments in fuel injection systems, control devices, and other auxiliary units are covered in this section.

5. MARKET PLACE. You find here a convenient, time-saving listing of sources from which you can obtain the multitude of items and services needed by the growing diesel industry.

6. ADVERTISING. Information of value to you is refined and presented attractively by professional advertising talent in this important section of Volume 20, DIESEL ENGINE CATALOG.

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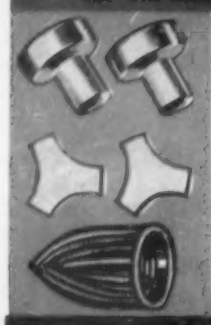
SPECIALISTS IN INJECTOR PARTS
for the Model "71" Diesel



INJECTOR CROWN VALVE Part No. T-7319. Replaces and improves on GM Part No. 5227319, yet sells for considerably less.

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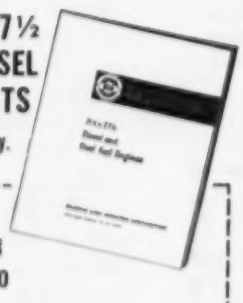

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GM Powerama

A giant outdoor exposition portraying the dramatic contributions of diesel and aircraft power to America's industrial economy will be staged by General Motors on Chicago's lakefront August 31 through September 25, Harlow H. Curtice, General Motors president, has announced. The "General Motors Powerama" will be open to the public in a 1,000,000-square-foot area on South Lake Shore Drive, adjacent to Soldier Field. This was the site of the Century of Progress exposition in 1933-34.

Admission to the 26-day "world's fair of power" will be free. Entertainment on the colorfully decorated Powerama grounds will range from stage shows, with singing and dancing, to exhibits showing actual operation of the modern locomotive, saw mill, cotton gin, earth mover, fighter plane, and many other mechanical giants. Along a specially-built pier in a protected lagoon will be a varied array of marine equipment and craft, including a U.S. Navy submarine, a pleasure launch, shrimp boat, and many others. Visitors will be able to board these craft.

"Our aim in the Powerama is to unfold the seldom-heard but truly exciting story of how relative newcomers on the industrial power scene—Diesel and gas turbine engines—are giving the nation new muscles to build its roads, cut its timber, drill its wells, clear and plow its fields, propel its ships and aircraft, drive its trains, and turn the wheels of its machines," Mr. Curtis said. "With the Powerama, General Motors will turn from its well-known consumer products, to a display of the latest in land, air, and marine equipment produced or powered by our diesel, aircraft, and heavy equipment divisions. The tremendous strides being made in these fields will be the theme of the Powerama. Our show also will celebrate the production this year of General Motors' 100 millionth diesel horsepower. Within the span of 20 years, General Motors' output of diesel engines has given America more power capacity than that of all of the country's privately owned steam and hydro-electric generating plants."

In an outdoor theater, a stage show will be presented four times daily. Also featured will be GM's XP-21 Firebird, first gas turbine automobile built and tested in the United States, plus the seven experimental cars and the truck which were among the hits of this year's Motorama at New York, Miami, Los Angeles, San Francisco, and Boston.

Harlow H. Curtice (left), president of General Motors and C. R. Osborn, vice president in charge of GM's Engine Group inspecting a scale model of the General Motors Powerama.

But the top stars of the Powerama will be the big-muscled members of the family—the dump trucks, locomotives, scrapers, tractors, boats, and a variety of engines and other equipment. GM divisions with exhibits will include Allison, Cleveland Diesel, Detroit Diesel, Diesel Equipment, Electro-Motive, Euclid, Fabricast, Frigidaire, and GMC Truck & Coach. A few of the exhibits planned include: world's largest dump truck; an M-48 tank with the control apparatus outside where spectators can watch an operator control the steel monster; a full-scale model of a vertical rising aircraft, showing how the "Pogo" plane takes off straight up; an oil drilling rig in operation; an operating cotton gin; a diesel locomotive, mounted to "run" without moving, so visitors will be able to operate it; and a full-scale exhibit showing all the steps in building a modern road.

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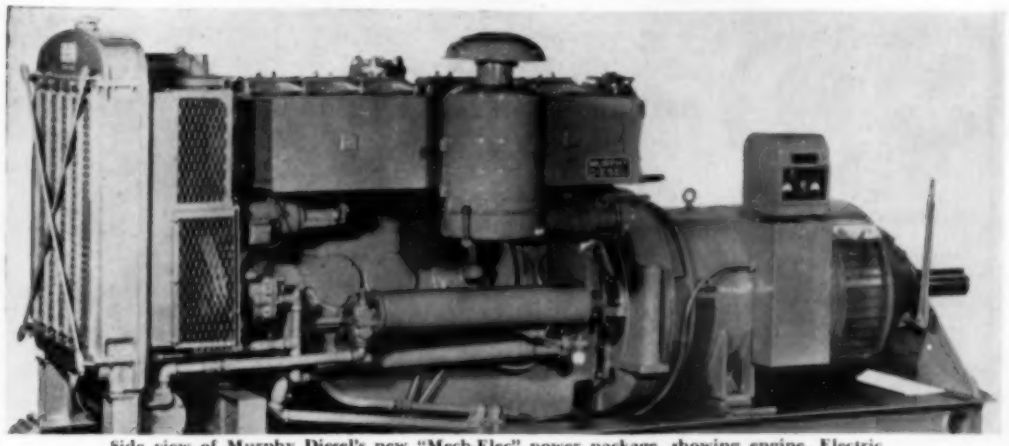
New "Mech-Elec" Package



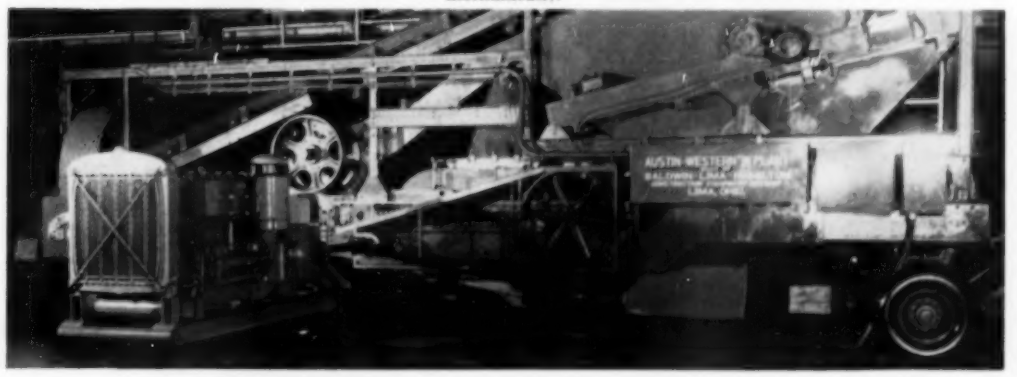
Side view of Murphy Diesel's new "Mech-Elec" power package, showing engine, Electric Machinery alternator, and Twin Disc power take-off. Mounted integrally on a steel base, compactness and simplicity are obtained.

A NEW "Mech-Elec" power package which permits both electrical and mechanical power to be taken out of a single diesel engine recently was announced by Murphy Diesel Co. The engine drives the generator through a flexible coupling. Behind the generator is a clutch with a power take-off shaft. The power units thus built to utilize the common drive shaft for two types of power is offered in eight models ranging from 144 to 225 hp. The generator is a 75-kw alternator for all sizes of power units.

The portable Austin-Weston rock crushing plant illustrated is a good example of the various applications wherein both electrical current and straight engine mechanical drive are needed. When one power unit can serve both functions, compactness, flexibility, and economy are achieved. The Murphy diesel delivers 210 hp for the rock crusher. The crushing operation is mechanically powered via the power take-off and through a Spicer drive. The alternator supplies current for electric motors which drive conveyor belts, and for other electrical requirements of the portable plant. Thus, the rock crusher is self-sufficient and can be put into operation in remote areas.

Generators used are Electric Machinery 75 kw, 3-phase, 60 cycle alternators. The control panel and voltage regulator are dust protected and are designed to keep the voltage constant. Either a 480 or 240 volt system is available. A Twin Disc power take-off is utilized. The integrated unit is mounted on a structural steel base.

Austin-Western portable rock crushing plant, powered by 210-hp Murphy diesel. Engine motivates electric current needed for various purposes and drives crushing elements mechanically.



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SAFETY CONTROL

AMOT Model 1476-47 automatically shuts down engine on high water temperature or low lube oil pressure. Features are:

1. No capillary tube and bulb used.
2. Uses well known AMOT element.
3. Several temperature sensing units can be used with one control unit.
4. Will operate an air whistle.
5. Will operate a diaphragm gas valve for large gas engines.
6. Will operate as a fuel shut-off valve.
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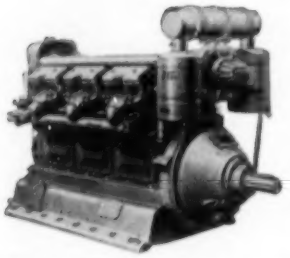

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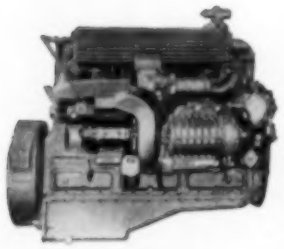

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